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Working Paper Series

Development of a SASS 1993-94 School-Level Student Achievement Subfile: Using State Assessments and State NAEP Feasibility Study

Working Paper No. 97-44 **December 1997**

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December 1997

Foreword

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Development of a SASS 1993-94 School-Level Student Achievement Subfile: Using State Assessments and State NAEP

Feasibility Study

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Prepared for:

U.S. Department of Education
Office of Educational Research and Development
National Center for Education Statistics

December 1997

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Acknowledgments

This report grew out of a response to a presentation at NCES on the future of SASS by Philip Kaufman in early 1996. Kaufman contributed specific proposals for ways to add student achievement measures to SASS but left the possibility of using state assessment data for others to investigate. Meanwhile, in a subcontract for a grant to Bruce Spencer, at Northwestern University, to study school nonparticipation in State NAEP, the American Institutes for Research had gathered a database of state assessments in reading in 1994. On this project, which was directed by Liz Hartka, Inna Shapotina developed files merging state assessment data with State NAEP data for 20 states. This database provided the foundation for exploring the feasibility of merging state assessment data with SASS.

When NCES decided to fund a feasibility study on merging state assessment data with SASS, AIR proposed also to make use of between-state information provided by State NAEP to place different state assessments on a common metric. While no claim can be made that state assessments are interchangeable with NAEP, they might prove sufficiently correlated to use as the basis for carefully designed SASS analyses. In a meeting at NCES in January 1997, Michael Ross, Mary Rollefson, Dan Kasprzyk, and Steve Kaufman, representing SASS, and Sharif Shakrani and Gary Philips, representing NAEP, provided crucial guidance for the project, setting forth both the objectives that were most critical to demonstrate the feasibility of a SASS school-level student achievement subfile and clarifying the limits that must be acknowledged if one were to use such a subfile as the basis for educational research analyses. Michael Ross continued

to provide valuable guidance throughout the development of the file and of this report, and comments of members of the SASS Technical Review Panel helped to shape this final version of the feasibility study report.

Implementation of the study was supported by efficient programming efforts of Ann Win and great care by Susan Cole in putting together various documents to create a presentable report. Their support, and that of two others at AIR, Jill Allen, and Albert Chang, helped to make this report possible.

The authors wish to express appreciation for the work of all of these individuals and to the state assessment directors who provided the crucial data for the subfile. We realize that the SASS achievement subfile is, as yet, unfinished, as are the preliminary analyses presented in this report. However, we hope that the report adequately reflects the contributions of all who have helped the project.

Grace Wu
Mark Royal
Don McLaughlin

1. *Purpose and Description of SASS Student Assessment Subfile Pilot Study*

The Schools and Staffing Survey (SASS), conducted by the National Center for Education Statistics (NCES), offers the most comprehensive picture available of elementary and secondary schools in the United States. Initiated in 1987-88 and repeated in 1990-91 and 1993-94, SASS consists of surveys of districts, principals, and teachers associated with a national sample of schools. Through its four core components—the Teacher Demand and Shortage Questionnaire for Public School Districts, the School Questionnaire, the School Principal Questionnaire, and the Teacher Questionnaire—SASS provides information on:

- district enrollment and staffing patterns (for public schools), along with district policies, programs, and services
- school characteristics and staffing, as well as school policies, programs, and services
- principals' backgrounds, education, and experience, together with their perceptions of school decision-making procedures and problems
- teachers' training, experience, and compensation, along with their attitudes toward teaching and their future plans

Given the broad reach of SASS, it can speak to a variety of important educational research and policy questions. The value of SASS would be even greater, however, if information on districts and schools could be directly related to student outcomes. With such data available, SASS could more meaningfully inform debates over the factors that

relate to school effectiveness and contribute to a broad-based evaluation of school improvement strategies. Boruch and Terhanian (1996) have pointed out the added value of linking NCES surveys to data from other sources.

A relatively inexpensive source of school-level achievement data, more accessible now than ever before, is state assessment data. Most states are currently involved in some form of assessment of school performance in terms of student test scores.[1] Through cooperation with these states, it is possible to develop a SASS student achievement subfile that both adds an outcome dimension to SASS and provides in-depth data for use by states in understanding the organizational factors that are associated with variation in their schools' achievement test scores.

Of course, state assessment data are only available for public SASS schools; and some SASS schools are located in states that do not carry out student assessments. If states that conduct assessments differ in important ways from those that do not, then results of analyses based on a SASS student achievement subfile might not be entirely generalizable to public schools nationwide. Also, state assessments are only conducted in some grade levels, and some SASS public schools (e.g., many high schools) may have no students enrolled in those grades. Nonetheless, if a linkage were carried out in all possible states, state assessment data would be missing for only about one-third of the 8,767 SASS public schools. Moreover, because the public school sampling design for SASS uses "state" as a major stratification variable, analyses restricted to the subset of states for which assessment data are available would be valid and meaningful.

Pooling the results of analyses of individual state data across states adds substantial power to the comparison of SASS organizational measures to achievement measures. However, this pooling would be facilitated by placing the state assessment data on a common scale. An important aspect of this study is to determine whether the availability of State NAEP data for most states that conduct state assessments will support the creation of a common achievement metric. Making use of State NAEP data, linkages can be constructed that allow the transformation of different state assessments with a similar focus (e.g., reading) onto a common metric. Although not essential for the use of state assessment data with SASS, such linkages will allow *between-state variation* to be incorporated into school-level achievement scores.[2]

To address questions about the feasibility, power, accuracy, and generalizability of analyses that combine SASS data with state assessment data, ESSI undertook this pilot study, which involves merging 1993-94 SASS data with state assessment data from selected states. Chapter 2 of this report describes the development of the pilot SASS

[1] Forty-five states had statewide assessment systems in 1994-95; the remaining five states either did not have a statewide system at all or had temporarily suspended their programs (National Education Goals Panel 1996). In 1995-96, forty-six states administered statewide assessments (Roeber, Bond, and Braskamp, 1996) .

[2] A separate project is being carried out by ESSI to evaluate the feasibility of linking state assessments to NAEP, using student-level data. The SASS student achievement subfile pilot study, reported here, is not directly related to that other linking study.

student achievement subfile and the preparation of the different measures of student achievement used in the study. Chapter 3 then presents analytical results concerning the developed SASS student achievement measure and preliminary analyses of a model relating student achievement levels to student background characteristics and school attributes measured by SASS.

2. *Development of a SASS Student Achievement Subfile*

This chapter describes (1) the principal data sets used in linking SASS and state assessment data, (2) the procedures followed in merging school information from SASS with school information from state assessment files, (3) the results of the merging process, and (4) the development of an achievement measure for inclusion on the SASS student achievement subfile. School-level state assessment data are reported in a different format in each state, as they are not intended to be aggregated with assessment data from other states. As a result, some effort is involved in creating SASS-state assessment linkages. The details of the linkage process are documented here to provide a basis for similar file creation in the future; however, readers who wish primarily to evaluate the utility of the file thus created may skip the remainder of this chapter and proceed to Chapter 3.

We did not expect to be able to add an achievement measure for every SASS public school, because some schools are not assessed, and a few states had no systematic achievement assessment program in 1993-94. However, the aim was to add a measure for most SASS public schools in each of 19 selected states and to identify the reasons why assessment scores were not available for the remainder of the schools in the 19 states. With these results, it becomes possible to estimate the scope and generalizability of findings based on the SASS student achievement subfile.

Data Sets Used in Linking SASS and State Assessment Data

Both federal and state data sets were used to conduct this study: the 1993-1994 Schools and Staffing Survey (SASS) data file, the 1991-1992 Common Core of Data (CCD) file, nineteen 1993-1994 state assessment data files (obtained and cleaned as part of a previous project), and the 1994 State NAEP fourth grade reading data file.

SASS and CCD

The 1993-94 SASS and 1991-1992 CCD files were obtained from NCES. The 1991-92 Common Core of Data formed the public school sampling frame for 1993-94 SASS.[3] A comprehensive national database maintained and updated annually by NCES, CCD provides descriptive and fiscal information on schools and districts, along with data on staff and students.

A critical feature (not widely known) of the CCD files is that for most public schools in the nation they contain both standard federal identification codes and the codes used by individual states to identify the schools on state data files. The presence of these two identification codes, one of which matched the SASS school identification code (on the restricted use data set) and the other of which matched the school identification code on the state assessment data file, facilitated the matching process in most (but not all) cases. SASS data were linked to CCD by way of the standard federal identification codes for schools (present on both SASS and CCD files), and the resulting records were linked to state assessment data by way of the school identifiers used by the states (present on both CCD and state assessment files). Many of the SASS schools in the states included in the study for which state assessment data were not available were very small schools or schools serving special populations of students.

State assessment data

The state assessment data used for the current study were obtained from an existing database maintained at the American Institutes for Research (AIR). For a separate study of the representativeness of the State NAEP sample, funded by the NAEP Data Reporting Grant program, AIR had previously contacted the thirty-nine states that participated in the 1994 State NAEP fourth grade reading assessment and had succeeded in gathering school-level state assessment scores from twenty-three of them. Assessment data from four of these states were deemed inappropriate for use in the current pilot study, leaving a total of nineteen state assessment data sets.[4] These 19 states contained 3,668 of the 8,767 SASS public schools.

[3] "The CCD is based on survey data collected annually by NCES from all state education agencies, and is believed to be the most complete list of public schools available. The frame includes regular public schools, Department of Defense-operated military base schools, and nonregular schools such as special education, vocational, and alternative schools" (Henke, Choy, and Geis, 1996, p. 193).

[4] The nineteen states included in the present study were: Alabama, California, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Montana, New York, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, and Washington. Arkansas was excluded because reading assessment

State NAEP data

The 1994 State NAEP fourth grade reading data file was acquired from the Educational Testing Service (ETS), with NCES approval, for use in exploring the value of adjusting state assessment scores to account for between-state variation.

Merge Procedures

Three steps were involved in matching state assessment scores with SASS public schools.

Step 1: Selection of SASS schools with students enrolled in assessed grades

Reading assessment scores from the 1993-94 school year were used in this study, both because of the importance of reading as a measure of educational achievement and because of the availability of NAEP fourth-grade reading scores for the same year. Table 1 lists the grade levels for which state reading assessment data were available in the nineteen states included in this study. All nineteen states had assessments at the elementary level, and sixteen states also had assessments at junior high or high school levels. SASS schools that did not report students enrolled in at least one grade covered by assessments in their states were eliminated before any attempt was made to merge with state assessment files. A total of 2,859 SASS public schools in the nineteen states enrolled students in a grade that was assessed in the corresponding state assessment.[5]

scores were reported at the district level rather than the school level; Wisconsin was excluded because data were available only for a minimum competency test; and Connecticut and New Hampshire were excluded because of pilot study limits on time for data entry and matching.

[5] Some schools enrolled students in more than one grade covered by assessments in their states. Where one of these grades was grade 4, we used the fourth-grade assessment scores. Otherwise, we used assessment scores associated with the lowest of the covered grades. In 18 of the 19 states, essentially all regular schools participated in state assessments. In Pennsylvania, however, only one-third of schools were included in 1994, as a random sample.

Table 1— Number of SASS public schools in 19 states with state assessment data

State	Grades with assessment data	# of SASS schools	# with assessed grades	# without assessed grades
Alabama	4, 8, -	224	160	64
California	4, 8, 10	352	311	41
Delaware	3, 8, 10	63	55	8
Florida	4, 8, -	228	166	62
Georgia	3, 5, 8, 11	168	164	4
Hawaii	3, 8, -	85	77	8
Kentucky	4, 8, 12	149	140	9
Louisiana	4, 7, 11	207	189	18
Maine	4, 8, 11	145	136	9
Massachusetts	4, 8, -	208	116	92
Michigan	4, -, -	202	78	124
Montana	3, 4, 8, 11	178	172	6
New York	3, -, -	269	88	181
Pennsylvania	5, 8, 11	169	148	21
Rhode Island	4, 8, 10	88	81	7
Tennessee	4, 8, -	179	115	64
Texas	4, 8, 10	380	355	25
Utah	5, 8, 11	174	163	11
Washington	4, 8, -	200	145	55
Totals		3,668	2,859	809

Step 2: Verification of SASS schools

The CCD file provided an important link between SASS and the state assessment data. Given that a CCD public school identifier was available on the restricted SASS file,[6] and that most CCD records contained codes used by states to identify their schools, SASS schools could be matched to state assessment data if SASS data could first be matched to CCD data. Four CCD variables were then used to match schools to state assessment files: CCD state agency ID, CCD school agency ID, school name, and city. Table 2 shows, however, that in the 19 states included in this study a total of 214 SASS public schools with positive enrollments in grades covered by their state assessments did not have valid 1991-92 CCD school identifiers on the SASS file (most were blank or nines). Fortunately, NCES was able to provide a separate file containing the names and addresses of these SASS schools to help in matching them to state assessment data.

[6] The variable was not on the restricted SASS file at the outset of the study, but a separate file was provided to AIR with the CCD identifiers.

Table 2— Number of SASS schools with assessed grades, by CCD identifier

State	SASS schools with assessed grade	SASS schools with assessed grade and a valid CCD identifier	SASS schools with assessed grade but not a valid CCD identifier
Alabama	160	149	11
California	311	289	22
Delaware	55	52	3
Florida	166	141	25
Georgia	164	145	19
Hawaii	77	76	1
Kentucky	140	135	5
Louisiana	189	180	9
Maine	136	128	8
Massachusetts	116	109	7
Michigan	78	69	9
Montana	172	143	29
New York	88	87	1
Pennsylvania	148	138	10
Rhode Island	81	74	7
Tennessee	115	111	4
Texas	355	331	24
Utah	163	158	5
Washington	145	130	15
Total	**2,859**	**2,645**	**214**

Step 3: Matches to State Assessment Files

State identification codes on the CCD file and school and city names were used to merge SASS schools with state assessment schools.[7] State assessment files in sixteen states had school codes, most of which could be matched to substrings of the CCD state agency ID and the CCD school agency ID.[8] Montana only had district data and codes; and for Alabama, we used city name and school name to merge SASS schools with state assessment schools. For Rhode Island, scores were entered from a printed report, after a match on school and district/city name. Secondary merges were employed for SASS schools that did not initially match with state assessment schools, due to changes in school codes, school names, etc. School names and district names were used as secondary variables for verification and additional merges in all states except Louisiana and New York, where these variables were not present on state assessment files.

[7] See Section 3 of Appendix A for a table showing the specific CCD fields used for merging with state assessment data for each of the nineteen states.

[8] State agencies' codes varied in length, but the CCD fields for the state education agencies' school identification codes were allocated a length sufficient to include the longest of the state sets of codes.

Merge Results

Table 3 provides an overview of the merge results. Of the 3,668 SASS public schools in the 19 selected states, 2,859 had students enrolled in grades corresponding to the state assessment. We successfully merged 2,575 of these SASS schools with state assessment scores. These schools enroll 40 percent of the nation's public school students. Of the other 284 SASS schools, 254 did not match with state assessments, and 30 merged with state assessment files but did not have valid reading scores. The 30 SASS schools without valid reading scores included 22 in California, 1 in Florida, 3 in Maine, and 4 in Texas.

Overall, we were able to merge all the SASS public schools with assessed grades to state assessment schools in four of the nineteen states: Alabama, Hawaii, New York, and Tennessee. Eight other states had fewer than 10 SASS public schools with assessed grades that did not match schools on the state assessment data file.

Table 3— Results of merging SASS schools with state assessments

State	No. of SASS schools with an assessment grade	No. of SASS schools with state assessment scores	No. of SASS schools on state assessment file, but missing scores	No. of SASS schools with assessed grade not matched
Alabama	160	160	0	0
California	311	240	22	49
Delaware	55	50	0	5
Florida	166	140	1	25
Georgia	164	163	0	1
Hawaii	77	77	0	0
Kentucky	140	133	0	7
Louisiana	189	184	0	5
Maine	136	123	0	13
Massachusetts	116	110	3	3
Michigan	78	76	0	2
Montana	172	160	0	12
New York	88	88	0	0
Pennsylvania	148	55	0	93
Rhode Island	81	80	0	1
Tennessee	115	115	0	0
Texas	355	335	4	16
Utah	163	160	0	3
Washington	145	126	0	19
Total	**2,859**	**2,575**	**30**	**254**

Table 4 lists the number of SASS public schools that did not match with state assessment schools, broken down into special, alternative, or vocational education schools (e.g. Special Ed Center, Alternative Center etc.) and schools that had enrollment of less than 10 in the grade assessed by the state. Of the 254 SASS public schools that did not match with state assessment files, 112 were special, alternative, or vocational education schools, or schools that had an enrollment of fewer than 10 in the grade assessed. The

large number of special schools in California, Florida, Maine, and Texas are responsible for many of the non-matches between SASS schools and state assessment files.

Other than the special and very small schools in those 19 states, only 142 public schools in SASS with enrollments in assessed grades did not match with state assessments. Most of these were in three states: Pennsylvania, California, and Washington. Of the 142 schools, 86 were in Pennsylvania, where matrix sampling was used and only one-third of the schools in the state participated in the 1994 state assessment.[9] In California, the state assessment system had undergone political problems, and this may be the reason we did not find 21 SASS schools on the state assessment file. These political problems may also help explain why 22 other SASS schools that *were* found on the California state assessment file did not have valid reading scores (see Table 3). Corresponding explanations for the 36 remaining non-matched schools in 10 other states were not sought in detail. However, some were high schools that had very small, but nonzero, 8th grade enrollments. It is understandable that those students might not be included in a state assessment.

To summarize, of the 3,668 SASS schools in the 19 states included in this study, assessment scores were found for 2,575. Of the remaining schools, 809 had no students in the grades covered by state assessments; 81 were special, alternative, or vocational schools; 31 had fewer than 10 students in the assessed grades; 30 did not have valid reading scores on the state assessment files; and 86 were located in Pennsylvania, where only a sample of schools was assessed in 1994. Thus, average achievement scores were identified for 2,575 of the 2,631 SASS schools that were expected to have matching assessment scores, for a match rate of 97.9 percent. Improvement on this match rate would require calls to individual state agencies, to resolve matching problems created by school name changes, etc.

The grade level distribution of schools included on the pilot version of the SASS student achievement subfile differs somewhat from that of the entire range of SASS public schools, because many states only conduct assessments at the elementary and intermediate levels. As shown in Table 5, the population (weighted) percentage of schools with average student achievement scores that were high schools is only about half as great as the overall percentage of high schools (11.5 percent, vs. 23.9 percent), and none of the small number (1.4 percent) of ungraded schools were included. For this reason, it is essential that analyses of the SASS student achievement subfile be carried out within grade level; analyses that lump all grade levels together would over-represent elementary schools.

[9] We assume that nearly all of the 86 non-matching Pennsylvania schools were not included in the state's assessment sample in 1994, but it is possible that some number may be true non-matches (i.e., SASS schools for which SASS and state assessment information could simply not be merged). In 1995-96, by comparison, Pennsylvania assessed all 5th, 8th, and 11th grade students in reading (Roeber, Bond, and Braskamp, 1996).

Table 4— Number of SASS schools that did not match with state assessment, by state

State	Number of SASS public schools with enrollment in the assessed grade but not matched			
	Total	**Special, alternative, or vocational education schools**	**Schools with enrollment less than 10 in assessed grade**	**Other schools**
Alabama	0	0	0	0
California	49	21	7	21
Delaware	5	2	3	0
Florida	25	16	6	3
Georgia	1	0	0	1
Hawaii	0	0	0	0
Kentucky	7	3	1	3
Louisiana	5	5	0	0
Maine	13	11	2	0
Massachusetts	3	0	2	1
Michigan	2	0	1	1
Montana	12	1	3	8
New York	0	0	0	0
Pennsylvania	93	6	1	86
Rhode Island	1	0	0	1
Tennessee	0	0	0	0
Texas	16	11	2	3
Utah	3	0	2	1
Washington	19	5	1	13
Total	**254**	**81**	**31**	**142**

Table 5— Weighted distribution of public schools with achievement scores and other public schools, by school level

	Schools with achievement scores		**Other public schools**	
Elementary	19,794	68.6%	29,360	56.6%
Middle	4,712	16.3%	8,179	15.8%
Secondary	3,334	11.5%	12,377	23.9%
Combined	1,047	3.6%	1,188	2.3%
Ungraded	0	0	750	1.4%
		100%		100%

Table 6 compares the geographic distribution of schools included on the SASS student achievement subfile to that of SASS schools generally. (Note that the CCD categories used are defined based on 1984 census classifications. By 1993-94, some school locales may have changed.) As can be seen in Table 6, rural schools were less likely than others to be included on the pilot SASS student achievement subfile (21 percent, vs. 29.7 percent). Thus, analyses that ignore the locales of the schools will slightly tend to overrepresent urban schools. This difference is primarily due to the selection of states for the pilot study: the percentage of public schools that are rural in those 19 states, based on CCD, is 20 percent, compared to 33 percent elsewhere. In completing the SASS 1993-94 student achievement subfile, an attempt will be made to add states with large rural populations.

Table 6—Weighted distribution of public schools with achievement scores and other public schools, by locale

	Schools with achievement scores		Other public schools	
Large Central City	3,675	12.7%	4,125	8.0%
Mid-size Central City	4,594	15.9%	6,790	13.1%
Urban Fringe of Large City	4,559	15.8%	7,174	13.8%
Urban Fringe of Mid-size City	3,671	12.7%	4,240	8.2%
Large Town	658	2.3%	1,611	3.1%
Small Town	5,668	19.6%	12,508	24.1%
Rural	6,062	21.0%	15,405	29.7%
		100%		100%

SASS Reading Achievement Scale Definition

Once the matching process was completed, one of several state assessment measures was selected for inclusion on the pilot SASS student achievement subfile. In each of the 19 states, a published school-level reading or reading-related state assessment score was identified. The assessment scores were based either on nationally standardized tests or on assessment instruments developed by the State Education Agency for use in the state. The measure selected was a total reading score, or in a few cases at upper grades, a language arts score; when there were several such scores, the one most highly correlated with the State NAEP reading score was selected. The standardization was carried out in three steps.

Step 1: Removal of state scale differences

Because the test instruments were scaled differently in each state, use of the raw test scores for analyses aggregated across states would be meaningless. Schools in a state that scored its test from 500 to 1500 would appear to be far more effective than schools in a state that scored its test from 0 to 100. To address this difference, the school mean scores were adjusted to have a mean of 0 (zero) and standard deviation of 1 (one), at each grade in each state (Equation 1.1).

$$State - z = (\text{School Mean} - \text{State Mean}_{Grade}) / \text{State Standard Deviation}_{Grade} \quad (1.1)$$

The measure thus created, STATE-Z, would compare each school with other schools assessed at the same grade in the same state. The state mean and standard deviation were computed based on the SASS schools with assessment data in the state. This measure would be appropriate for analyses that pool within-state comparisons across states. However, this measure would not be sensitive to between-state relations between school characteristics and achievement. Moreover, to use this measure appropriately in cross-state analyses of SASS, one must also standardize the school characteristics to have the same mean and variance in each state—a nuisance, but not an insurmountable difficulty.

Step 2: Incorporation of state differences based on NAEP

To incorporate between-state variation in achievement into the SASS achievement measure, State NAEP was used. Starting with STATE-Z, the scores were multiplied by the standard deviation of NAEP school means in the state, and the state NAEP mean was added to all of the scores in that state (Equation 1.2). For this purpose, the 1994 State NAEP reading scale scores were used. The NAEP means and standard deviations were based on scores for schools that had been merged with state assessment data as a part of a previous project, though they could equally well have been based on the entire State NAEP sample in the state. To avoid confusion between the SASS student achievement measure and NAEP, the resulting school means were rescaled to a mean of 50 and a standard deviation of 20 (Equation 1.3).

$$Y = (State - z) \times (\text{State NAEP Standard Deviation}) + \text{State NAEP Mean} \quad (1.2)$$

$$\text{NATLPUB} = (Y - \overline{Y}) \times (20 / \text{Standard Deviation}(Y)) + 50 \quad (1.3)$$

The measure thus created, NATLPUB, would place each school on a common scale with other schools in the 19-state SASS sample. However, there would be no assurance that the reading achievement score measure in one state was measuring the same thing as the reading achievement measure in another state. Moreover, because the 4th grade State NAEP reading assessment was used for this step, extrapolations to achievement measures based on assessments of other grades are based on the assumption that the ranking of states on reading achievement is similar across grade levels. If that assumption is faulty, then analyses of the relations of student achievement to school

characteristics at other grades (e.g., in high schools) should not necessarily be expected to yield coherent results; while analyses within any one state would be meaningful, aggregating across states would be problematic. One set of analyses in this report addresses the reasonableness of this assumption (see the discussion of Research Question #5 in Chapter 3).

Step 3: Projection of within-state variation

As a final step, to align within-state variation more closely with the NAEP scale, Equations 1.2 and 1.3 were recomputed after the within-state deviation from the state mean was multiplied by the correlation between NAEP and the state assessment (Equations 1.4 and 1.5). State assessments can be expected to tap both domains covered by NAEP and other domains. The correlation between NAEP and state assessment scores provides a measure of the similarity between the tests. Thus, in a sense, multiplying the within-state deviation from the state mean by the correlation between NAEP and the state assessment "projects" the state assessment variation onto the NAEP scale, capturing that part of the state assessment that was like NAEP. In a state in which the state assessment was poorly correlated with NAEP, variation in the SASS achievement measure would be reduced. One of the analyses presented in the report analyzes the correlations of state achievement scores with State NAEP in each state (see the discussion of Research Question #1 in Chapter 3). [10]

$$\begin{aligned} Y^{*} = &(\text{State} - z) \times (\text{State NAEP Standard Deviation} \times r(\text{NAEP, State Assesment})) \\ &+ \text{State NAEP Mean} \end{aligned} \quad (1.4)$$

$$ACHIEVE = (Y^{*} - \overline{Y}^{*}) \times (20 / \text{Standard Deviation}(Y^{*})) + 50 \quad (1.5)$$

The variable thus created, ACHIEVE, is theoretically appropriate for within- and across-state analyses of SASS. However, in states with assessments that are not highly correlated with State NAEP, the full variation in reading achievement between schools is not as likely to be represented as in states whose assessments are highly correlated with NAEP. Thus, in any analyses that examine correlations between SASS school characteristics and student achievement, data from the "highly correlated" states will be given somewhat greater weight *de facto*.

It should be emphasized, in passing, that although State NAEP data were used to capture between-state variation in achievement, it would be highly misleading to interpret the SASS student achievement measure as a surrogate for a school's average NAEP proficiency. Not only are the different state assessments differentially correlated with NAEP, but it must also be remembered that State NAEP assessments are administered

[10] One state, not included in the report, was deleted from consideration when the assessment scores that AIR requested from it were found to be correlated 0.18 with State NAEP. In that case, the scores were apparently for a minimum competency measure, as school means ranged from 90% to 100%.

with different procedures and a different set of student and school motivations from the procedures and motivations associated with state assessments.

3. *SASS Student Achievement Analyses*

To evaluate the pilot SASS student achievement subfile and explore the value the addition of student achievement data would have for SASS, this chapter presents results of analyses designed to address five research questions:

1. How close are the NAEP-transformed scores to NAEP school means?

2. How similar are SASS public schools with student achievement scores to other SASS public schools?

3. Are there statistically meaningful school-level relations between the student achievement measure and SASS measures?

4. Does incorporating between-state variation into the student achievement score, using NAEP data, increase the power of the student achievement measure?

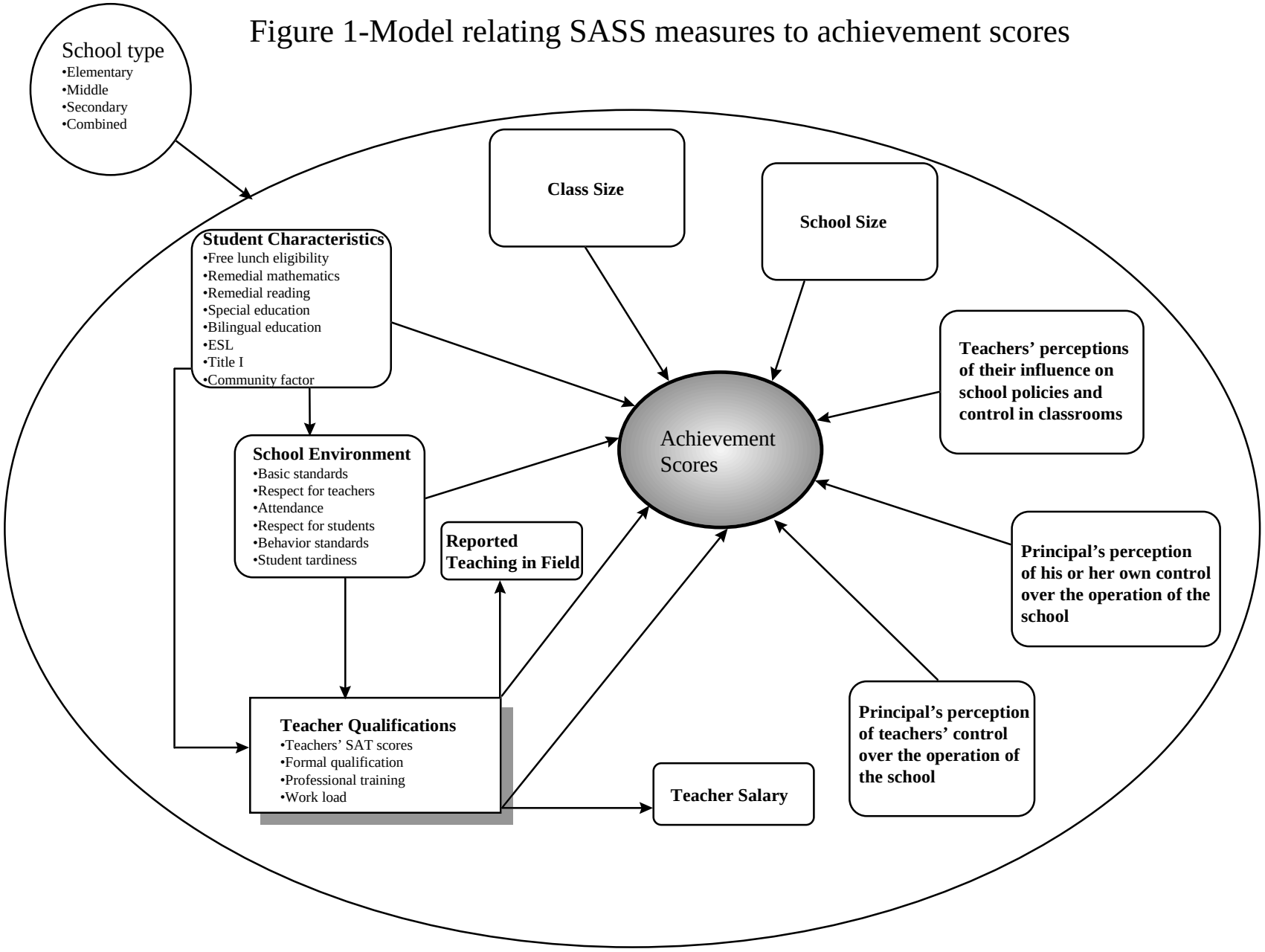
5. Can between-state variation in student achievement be extrapolated from elementary level scores to secondary level scores?

The first question is concerned with the extent to which different state assessments correlate with a single overall measure of reading achievement, based on NAEP, while the second research question is concerned with the representativeness of the 2,575 SASS schools for which student achievement data were obtained. The final three questions focus on the utility and generality of the student achievement subfile. Can it be used for

meaningful analyses relating school factors measured by SASS to student achievement? If so, are the student achievement measures improved by including between-state variation based on NAEP? Finally, can the between-state variation based on NAEP, which is derived from a 4th grade assessment sample, be generalized to secondary schools?

Figure 1 presents a model summarizing potential links between average student achievement in a school and various factors addressed by SASS: student background characteristics, teacher qualifications, the nature of the school climate, and key organizational features of the school. Because the model will be helpful in responding to the research questions outlined above, we review it briefly before proceeding to a discussion of these questions. In this review, we summarize the support that can be found in the literature for an association between each of the factors represented in the model and student achievement and describe how the factors were operationalized in the study using available SASS measures.

Figure 1-Model relating SASS measures to achievement scores



Model and SASS Measures

Student background characteristics

Family background and socioeconomic status have consistently been shown to be related to student achievement (Coleman et al., 1966; Hanushek, 1986). To explain these relationships, researchers have called attention to differences in students' health and nutrition, in the physical environments of their homes (e.g., noise levels), in the configurations of their families (e.g., single parent vs. dual parent households), in the parenting styles, beliefs, and expectations of their mothers and fathers, and in their inherited intelligence (for reviews, see Scott-Jones, 1984; Henderson and Berla, 1994). In studies of the relations between school attributes and achievement, student background characteristics are often included as control variables, capturing variation in academic performance that cannot be explained by differences in students' school experiences. However, while largely outside of school influence, the impact these variables may have on achievement is not likely to be entirely independent of school arrangements. In many cases, students may be at risk of academic failure not because of their familial or socioeconomic backgrounds *per se*, but rather through a misfit between school offerings and demands and their particular needs and capabilities (Gordon and Yowell, 1994). Lareau (1987), for example, illustrated how the limited educational backgrounds and other resources of working-class parents interfered with their ability to meet school expectations regarding appropriate levels of involvement in their children's schooling. Furthermore, as our model suggests, schools themselves may be influenced in multiple ways by the backgrounds of their students. Schools with students from more advantaged backgrounds may, for example, find it easier to recruit and retain highly qualified teachers and to maintain orderly and disciplined school environments.

Measures. Several SASS measures were used to address student background characteristics, including the percentages of students in a school who are eligible for free lunch, receive Title I services, or are in remedial mathematics, remedial reading, special education programs, bilingual education programs, or English as a Second Language programs. In addition to these reported percentages, a community factor, capturing the family backgrounds of students in a school, was constructed by averaging teachers' responses to three related attitudinal items concerned with the extent to which they perceive parental alcoholism and/or drug abuse, poverty, and racial tension to be problems in their schools.[11] Because a factor analysis found all of the student measures to be loaded on a single factor, a single student background composite was used in this study. The various SASS student background measures and the community factor were divided by their standard deviations and then averaged, as shown below:

[11] A series of attitudinal items were included in the principal's and teacher's questionnaires for SASS. These items were factor analyzed to identify a set of factors that would provide more reliable information about teachers, administrators, and their schools than individual items. These factors were used in *Private Schools in the United States: A Statistical Profile, 1993-94* (McLaughlin and Broughman, 1997). For a detailed description of the factors, see Appendix A.

Student background composite = average of (100 – Free Lunch Pct. / 29, 100 – Remedial Reading Pct. / 16, 100 – Remedial Math Pct. / 14, 100 – Bilingual Education Pct. / 11, 100 – ESL Pct. / 9, 100 – Special Education Pct. / 9, 100 – Title I Pct. / 21, Community Factor / 1.73)

Teacher qualifications

To the extent that greater teacher experience, education, and training are associated with higher quality instruction, teacher qualifications might be expected to be related to student achievement. Indeed, recent studies have provided support for such a link. Turner and Camilli (1988), for instance, found teacher education and experience to be associated with students' math and reading achievement. Monk (1994) similarly observed teachers' subject matter preparation to be positively related to student learning gains. In keeping with these findings, we expect that teacher qualifications will be positively associated with student achievement.

Measures. Because the state assessment data were merged with SASS at the school level, analyses must also be conducted at that level. The teacher qualification variables are, therefore, school-level averages computed from information provided by individual teachers. Available SASS qualification measures include: (1) teachers' years of experience, (2) teachers' level of education (i.e., possession of a masters degree or not), (3) teachers' participation in activities related to teaching (e.g., sponsored workshops or in-service programs, university extension or adult education courses, college courses in the subject field, professional growth activities sponsored by professional associations, committees to integrate academic skills into vocational curricula, or other curriculum committees), (4) teachers' participation in in-service or professional development programs, (5) teachers' ratings of the impact professional development programs have had on them, and (6) teachers' work load (i.e., the sum of the hours teachers were required to be at school during their most recent full week of teaching and the hours they spent after school, before school, and on the weekend in school-related activities, weighted by the standard deviations of the measures). The SAT scores of incoming freshmen at the colleges or universities attended by teachers were also obtained to capture the selectivity of these institutions.[12] From these available measures, four teacher qualification factors were constructed for use in the present study: (1) *Formal Qualifications* (the weighted sum of years of teaching experience and level of education), (2) *In-service Training* (the weighted sum[13] of items addressing participation in activities related to teaching, participation in in-service or professional development programs, and impact of professional development), (3) *Work Load*, and (4) *Selectivity*.

[12] The SAT scores of the teachers were obtained from another dataset, using information from the SASS teacher questionnaire on the college attended.

[13] Each term in a sum of differently scaled terms was divided by its standard deviation, to give variation on each term approximately equal weight in the sum. Thus, each term was effectively measured in standard deviation units.

One might expect teachers' salaries to be indicative of the quality of instruction students receive. However, schools with higher achieving students may find it easier to attract highly qualified teachers. The raw correlation between teacher salary and student achievement can, therefore, be misleading. Likewise, while one might expect that matching teachers to the subjects they feel most qualified to teach would lead to higher achievement, teachers' reports of teaching in field can be influenced by the success of their students. Again, the raw correlation between reported teaching in field and student achievement can be misleading.

Therefore, the qualification measures were combined into two separate composites: (1) the best predictors of salary variation, and (2) the best predictors of teachers' reports of teaching in field. The first composite indicates the combination of qualifications that is most valued by school districts, and the second composite indicates the combination of qualifications possessed by teachers who are teaching what they consider themselves to be most qualified to teach.

Teacher salary is the sum of teachers' academic year base salary and any additional compensation received from the school for extracurricular or additional activities. The reported teaching in field measure assesses the correspondence between teachers' main teaching assignments and the fields in which they feel most qualified to teach (reported teaching in field will equal 1 if the two SASS measures match and 0 if they do not). The predicted teacher salary and predicted teacher reports of teaching in field, linear combinations of the teacher qualification factors, were used to capture teacher qualifications in analyses. The specific linear combinations are shown below:

Elementary:

Teacher salary composite = (0.51 Formal Qualifications) + (0.06 In-Service Training) + (0.10 Work Load) + (0.30 Selectivity)

Reported teaching in field composite = (-0.04 Formal Qualifications) + (-0.04 In-Service Training) + (-0.08 Work Load) + (0.02 Selectivity)

Middle:

Teacher salary composite = (0.48 Formal Qualifications) + (0.06 In-Service Training) + (0.04 Work Load) + (0.42 Selectivity)

Reported teaching in field composite = (-0.04 Formal Qualifications) + (-0.02 In-Service Training) + (0.12 Work Load) + (0.06 Selectivity)

Secondary:

Teacher salary composite = (0.50 Formal Qualifications) + (0.10 In-Service Training) + (-0.08 Work Load) + (0.37 Selectivity)

Reported teaching in field composite = (0.11 Formal Qualifications) + (-0.15 In-Service Training) + (0.13 Work Load) + (0.03 Selectivity)

School climate

One of the more consistent findings in the effective schools literature is that an orderly and disciplined school climate is necessary to provide students with adequate opportunities to learn. As Purkey and Smith (1983) conclude in their review of this literature, "common sense alone suggests that students cannot learn in an environment that is noisy, distracting, or unsafe" (p. 445). Boyer (1995) has similarly argued that maintaining the school as "a disciplined place" is essential for effective schooling in the early grades. "Children, like the rest of us," he observes, "work best when they feel safe, when reasonable rules are sensitively established, thoughtfully explained, and reasonably enforced" (p. 25). An orderly school climate may not only enhance the performance of students but also the performance of teachers. Newmann, Rutter, and Smith (1989) have shown, for instance, that where student behavior is orderly teachers' sense of efficacy is higher, as are the expectations they hold for their students.

Measures. The school climate measure used in the present study incorporates six factors formed from principals' ratings of the seriousness of various school problems on the SASS Principal Questionnaire (i.e., Basic Standards, such as drugs and dropping out, Respect for Teachers, Community, Attendance, Apathy, and Respect for Property) and five factors formed from teachers' ratings of the seriousness of various school problems on the SASS Teacher Questionnaire[14] (i.e., Basic Standards, Respect for Teachers, Attendance, Respect for Students, Behavior Standards). These factors were averaged together with an additional factor formed from the appropriate average of three other SASS items (teachers' reports of tardiness in their classes, whether they have ever been threatened by students, and whether they have ever been attacked by students), weighting by factor standard deviations as shown below:

School climate measure = average of (Principal's perception of school problems / 1.61, Teachers' perception of school problems / 0.75, Teachers' perception of student behavior / 0.14)

School organization

Our model calls attention to relationships between student achievement and three aspects of school organization: (1) school size, (2) class size, and (3) principal and teacher control over the operation of the school (as reported by the principal), along with teacher influence on school policies and control of classroom practices (as reported by teachers).

[14] See Foonote 11

As Lee et al. (1993) note, two conflicting perspectives can be found in the literature on school size, one highlighting positive consequences of increased size (e.g., economies of scale and greater diversity of program offerings) and the other highlighting negative consequences (e.g., more formalized and impersonal social interactions). Recent empirical research is, however, more supportive of the latter perspective than the former. Larger grade sizes have been shown to be associated with reduced academic engagement among eighth-grade students (Lee and Smith, 1993). Similarly, at the high-school level school size has been found to be negatively related to students' early achievement gains (Lee and Smith, 1995), along with students' participation in school activities, satisfaction with school experiences, and school attendance (Lindsay, 1982). Dropout rates have also been shown to be higher in large high schools than in small high schools (Pittman and Haughwout, 1987). To provide students with a more stable and supportive educational experience, many reformers have called for dividing large schools into smaller subunits (e.g., Oxley, 1994). Likewise, Boyer (1995) has argued that to be effective, elementary schools must "be small enough for everyone to be known by name—perhaps with no more than four to five hundred students" (p. 17). Guided by recent research, we expect that school size will be negatively related to student achievement.

We similarly anticipate that class size will be negatively associated with student achievement. Meta-analyses of existing studies (Glass et al., 1982), along with large-scale research projects based on experimental designs (Finn and Achilles, 1990), have confirmed a link between class size and student learning (Mosteller, Light, and Sachs, 1996; for a critical review, see Slavin, 1989). Blatchford and Mortimore (1994) offer a number of possible explanations for the relationship between class size and student achievement. Small class size may facilitate more individualized and effective instruction, more complete curriculum coverage, and greater student involvement in classroom activities.

The effective schools literature calls attention to the importance of school-site management for student achievement (Purkey and Smith, 1983). To respond adequately to the needs of their students, it is argued, principals and teachers must be able to make many educational decisions for the school independent of district- or state-level officials. This literature also highlights the importance of instructional leadership at the school site for school effectiveness (Purkey and Smith, 1983), along with the ability of teachers to respond in innovative ways to instructional problems and challenges (Wehlage et al., 1989). It is, therefore, of interest to explore whether student achievement is higher where principals and teachers report having greater control over the operation of the school.

Measures. School size was measured by the total number of students enrolled in the school. A class size factor was constructed by averaging teachers' reports of their class sizes, teachers' reports of their satisfaction with their class sizes, and school-level measures of student/teacher ratios (weighted in terms of the standard deviations of the measures). Class size measures for schools were generated by averaging the reports of individual teachers. For a teacher teaching in a single self-contained classroom, class size is the total number of students enrolled in the teacher's class at the school. For a teacher

teaching in multiple departmentalized classrooms, by contrast, class size is the average number of students in the teacher's classes. The student/teacher ratio is calculated as the total number of students in a school, divided by the sum of the number of full-time teachers in the school and one-half the number of part-time teachers in the school. Finally, teacher's satisfaction with class size is captured by an item in the SASS Teacher Questionnaire asking teachers whether they are satisfied with the size of their classes; responses ranged from 1 ("Strongly Agree") to 4 ("Strongly Disagree").

Principals' perceptions of the control they and teachers have over the operation of their schools were captured through items on the SASS Principal Questionnaire asking principals how much actual influence they think each of several groups (e.g., the State Department of Education, district staff members, the school board, library media specialists/librarians, parent associations, the principal, and teachers) has on decisions related to establishing curriculum, hiring new full-time teachers, setting discipline policy, deciding how the school budget will be spent, determining the content of in-service programs, and evaluating teachers. The measures are scaled from 0 ("None") to 5 ("A Great Deal"). Principals' ratings of their own control over these decisions and their ratings of teachers' control over these decisions were averaged separately (dividing each item's score by its standard deviation) to form two control measures.

A separate measure of teachers' control in the classroom includes two factors formed from attitudinal items on the SASS Teacher Questionnaire: teachers' influence on curriculum (i.e., in establishing curriculum, in selecting textbooks and other instructional materials, and in selecting content, topics, and skills to be taught) and teachers' classroom control (i.e., in selecting teaching techniques, in evaluating and grading students, in disciplining students, and in determining the amount of homework to be assigned). These factors were appropriately averaged together with an additional item asking individuals whether they would choose to become teachers once more if they were beginning their careers all over again.

Results of Preliminary Analyses

We now turn to a discussion of the five research questions addressed in the pilot study.

1. How close are the NAEP-transformed scores to NAEP school means?

Within states, the information in the SASS student achievement measure is provided by state assessments; and *between states*, the information in the SASS student achievement measure is based on information provided by NAEP. Although all state assessments included in the file are English reading/language arts scores, they may differ substantially in format and content. However, to the extent that they measure similar constructs of student achievement, the results of analyses using the measure can be aggregated across states to represent a large portion of the population of American public

schools. Prior to the construction of the SASS student achievement measure, the (within state) correlations between NAEP and state assessment scores were computed based on the entire NAEP 4th grade sample in each state, and, as shown in Table 7, these correlations ranged between .32 and .86, with a median value of .66. For one state, not included in the SASS student achievement subfile, the correlation was .18.

Table 7— Correlations between state assessment and NAEP school means in reading in 1993-94, by state

State	Number in Overlap Sample	Correlation, based on Overlap Sample	Correlation, based on Entire NAEP Sample
Alabama	17	.67	.72
California	3	.90	.78
Delaware	14	.14	.32
Florida	4	.99	.85
Georgia	6	.63	.66
Hawaii	39	.55	.65
Kentucky	10	.81	.37
Louisiana	14	.83	.84
Massachusetts	8	.94	.82
Maine	18	.57	.63
Michigan	2	--	.73
Montana	27	.19	.50
New York	0	--	.39
Rhode Island	27	.91	.86
Tennessee	6	.49	.63
Texas	8	.60	.72
Washington	5	.91	.73
Median		**.67**	**.66**

SOURCE: 1994 NAEP Trial State Assessment in reading; state assessment files for 17 states.

To assess the extent to which the measures are similar for schools in the SASS sample, the correlations between the student achievement measure and the NAEP sample measure were also computed based on the overlap sample of 208 schools in 15 states. Because the overlap sample is a subsample of the entire (typically 100-school) NAEP sample in each state, the two sets of correlation coefficients (shown in Table 7) are somewhat different. The overall correlation based on the SASS/NAEP overlap sample was .73. To a certain extent, this correlation is a tautology, because the NAEP state means (for the sample) were used in the construction of the SASS student achievement measure. However, the median within-state correlation was also a fairly strong .67, indicating that, on average, a typical state assessment "sorts" schools similarly to NAEP. This correlation based on the overlap sample was comparable to the median within-state correlation based on the entire NAEP sample in each state, .66.

There was noticeable variation in correlations between states. Based on the total NAEP samples, correlations in thirteen states ranged from .63 to .86; however, in four other states, the correlations ranged from .32 to .50. Correlations based on the much

smaller overlap sample were more variable. In seven states, the correlations based on the overlap sample ranged from .81 to .99; in six of the states, the correlations ranged from .49 to .67; however, in two states, the correlations were only .14 and .19. Thus, one should not expect analytical results to be uniform across states. Nevertheless, in aggregate, when one recognizes that the NAEP school means have built-in error due to sampling and that both NAEP and state assessments have measurement error, these correlations must be considered acceptable as a basis for use of the SASS student achievement measure in research.

Within the overlap sample of 208 schools, the SASS student achievement school means typically differed from (a multiple of)[15] the NAEP school mean by about 6.3 points, a difference more than three-quarters as large as the standard deviation of the SASS student achievement school means for this sample (7.8 points). On the NAEP proficiency scale, such a difference would be 12.7 points. Thus, one would not be justified in considering the SASS school-level achievement measure to be a reliable estimate of an individual school's performance on NAEP. Nevertheless because all of the reading achievement scores are correlated with NAEP, the SASS student achievement measure appears to have substantial communality across states.

2. How similar are SASS public schools with student achievement scores to other SASS public schools?

How similar are SASS public schools for which we have student achievement scores to other SASS public schools? If the SASS public schools with student achievement scores are substantially different from other SASS public schools, then the generalizability of the results of analyses of the SASS student achievement subfile may be limited, and achievement data from a larger number of states may be needed to increase the representativeness of the data set.

Differences observed might be due to differences between schools in the 19 states represented in the study and schools in other states or to differences between schools with achievement scores in these 19 states and other SASS schools in the same states. Therefore, we first compare all 3,668 SASS public schools in the 19 states (both with and without achievement scores) with the 5,099 SASS public schools in the other states. Then, to test for within-state differences, the 2,575 SASS public schools with achievement scores in the 19 states are compared with the 1,093 SASS public schools without achievement scores in these same states. Results of the t-tests are shown in Tables 8a and 8b. (Note: separate t-tests were also carried out within elementary, middle, secondary, and combined school groupings, and the results were similar).

[15] The SASS student achievement measure was scaled to a different range from NAEP, as described in Chapter 2. For this comparison, NAEP was scaled to match the SASS student achievement scale.

Student Characteristics

Cross-State Comparison. The information displayed in Table 8a indicates that there are statistically significant differences[16] on thirteen of the fourteen student characteristic measures between the SASS public schools in the 19 states represented in the study and SASS public schools in other states. The SASS schools in the 19 states have higher percentages of students from minority ethnic groups, students in English as a second language and bilingual education programs, students in free lunch and Chapter 1 programs, students in remedial math and reading programs, and students from disadvantaged community backgrounds. SASS schools in the 19 states have fewer white students and fewer American Indian/Alaskan Native students. The mean percentage differences between SASS schools in the 19 states that have student achievement scores and other SASS public schools range from 1 percent to 5 percent, except for Hispanic enrollment, where the difference is 9 percent. One plausible explanation for some of these differences in student characteristics is that the 19 states represented in the study include California, New York, and Texas, all states that enroll many students from minority ethnic groups. Based on CCD, the average percentage of Hispanic students in the 19 states included on the subfile was 17 percent, compared to 6 percent in the states not included. By contrast, the average percentage of African American students was 16 percent on both subfiles.

Within-State Comparison. SASS schools with achievement scores differ significantly from other SASS public schools in the same 19 states on only six SASS student characteristic measures. The mean percentage differences range from 1 percent to 5 percent for most cases. SASS schools with achievement scores have higher percentages of Asian/Pacific Islander students and students in LEP, ESL, and free lunch programs, and fewer white students and students in programs for students with disabilities, than other schools in the same states. Some of these differences may reflect the fact that many of the SASS schools that could not be matched with state assessment data are special education schools.

Teacher Characteristics

Cross-State Comparison. Teachers' salaries and adjusted salaries are higher in the 19 states represented in the study than in other states (note that the SASS achievement subfile includes New York, Hawaii, and California, which have the highest cost of living of all states, so the differences are smaller for adjusted salaries). In addition, teachers in the 19 states participate more in professional development, feel that they receive less support for professional development, participate less in activities related to teaching, feel less qualified for their teaching assignments, and have fewer weekly hours of student interaction than teachers in other states. Schools in the 19 states also have more difficulty filling vacancies than schools in the other states.

[16] The Bonferroni correction was applied to adjust for the increased likelihood of erroneously finding differences significant resulting from the large number (61) of comparisons. For α=0.05, the Bonferroni-adjusted critical t value is 3.18.

Within-State Comparison. Teacher salary and adjusted salary are the only variables that show a difference between SASS schools with achievement data in the 19 states and other SASS schools in the same states. The lower pay teachers receive in the SASS schools for which we obtained state assessment data may be explained by the overrepresentation of elementary schools among assessed schools (See Table 5).

Table 8a— Comparison between SASS public schools in 19 states with state assessment scores and other SASS public schools

	Mean SASS measures for the 19 states	Mean SASS measures for the other states	19 states in the study vs. other states
Student Characteristics			
Hispanic, regardless of race	0.14	0.05	14.6237*
Black, not of Hispanic origin	0.15	0.14	3.3998*
Asian/Pacific Islander	0.04	0.01	12.2898*
White, not of Hispanic origin	0.66	0.77	-14.7695*
American Indian/Alaska Native	0.01	0.02	-4.4863*
LEP students	0.06	0.02	10.3152*
English as a second language	0.05	0.02	8.7932*
Bilingual education	0.04	0.02	3.4719*
Free lunch program	0.42	0.37	5.1178*
Chapter 1	0.18	0.13	6.1146*
Remedial reading	0.14	0.12	4.0033*
Remedial math	0.09	0.07	4.0848*
Programs for students w/disabilities	0.08	0.08	-0.3243
Community background	5.57	5.87	-5.7380*
Teacher Characteristics			
Mean teacher college SAT scores	925.91	914.79	0.0592
Years of teaching experience	14.79	14.80	-0.0836
Adjusted teacher salary	34,397.45	32,323.28	11.5172*
Teacher salary	34,582.11	31,170.88	19.7179*
Teaching in field feel best qualified	0.77	0.81	-6.0354*
Weekly hours-other school activity	8.51	8.45	0.5200
Hours at school per week	31.61	31.84	-1.1132
Weekly hours student interaction	2.75	3.15	-4.8807*
Participated in activities related to teaching	3.47	3.65	-5.3370*
Opinion about impact of professional development †	13.31	13.32	-0.0029
Participation in professional development	3.92	3.50	7.7278*
Support received for professional development	1.97	2.09	-5.5616*
Difficult filling vacancies †	6.93	6.09	4.6217*

Note: * indicates that the differences are statistically significant
Note: † higher numbers indicate more negative situations
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire).

Table 8a— Comparison between SASS public schools in 19 states with state assessment scores and other SASS public schools, continued

	Mean SASS measures for the 19 states	Mean SASS measures for the 33 states	19 states in the study vs. other 33 states
School Climate			
Teacher: basic standards	7.73	7.68	1.3077
Teacher: attendance	6.71	7.00	-6.9169*
Teacher: behavior standards	6.88	6.73	0.1085
Teacher: respect for students	5.94	5.99	-0.8105
Teacher: satisfaction	6.98	7.07	-1.6463
Teacher: respect for teachers	6.43	6.58	-3.2068*
Attacked by student last year	1.95	1.96	-1.1223
Ever physically attacked by student	1.89	1.90	-1.1013
Ever threatened by students	1.77	1.78	-0.8762
Number of students tardy per wk.	4.18	3.24	6.4066*
Class interruptions per week	17.15	15.04	0.6374
Principal: basic standards	8.57	8.49	2.3423
Principal: community	6.32	6.56	-3.9323*
Principal: attendance	6.74	7.12	-6.3125*
Principal: apathy	6.42	6.53	-1.8310
Principal: respect for teachers	7.84	7.94	-0.0622
Principal: respect for property	7.83	8.11	-5.5988*
Student non-attrition rate	1.11	1.11	-0.0520
School Organization			
Student/teacher ratio	17.92	16.19	0.4971
Average class size	23.64	21.67	10.1659*
Total enrollment	585.13	448.75	15.6290*
Teacher satisfied with class size †	2.22	2.06	7.7838*
Teachers: influence on budget	3.19	2.96	6.2928*
Teachers: determine in-service program	3.90	3.93	-1.0269
Teachers: influence discipline policy	4.01	4.01	-0.1972
Teachers: influence on hiring	2.68	2.39	6.3050*
Teachers: influence evaluating teachers	2.11	2.28	-3.8787*
Teachers' influence on curriculum	3.58	3.72	-3.7910*
Teachers' classroom control	6.49	6.52	-1.3043
Principal: determine in service program	3.95	3.91	0.0457
Principal: influence on hiring	4.29	4.32	-1.0895
Principal: influence on discipline policy	4.35	4.38	-1.1981
Principal: influence on budget	3.81	3.60	6.1744*
Principal: influence evaluating teachers	4.69	4.73	-1.7109
Principal: influence on curriculum	3.43	3.45	-0.5236
Sample size	**3,668**	**5,099**	**3,668 vs. 5,099**

Table 8b— Comparison between SASS public schools with student achievement scores and other SASS public schools in the same state

	Mean with achievement scores	Mean without achievement scores	With achievement scores in 19 states vs. without achievement scores
Student Characteristics			
Hispanic, regardless of race	0.15	0.11	3.02705
Black, not of Hispanic origin	0.16	0.14	1.01288
Asian/Pacific Islander	0.04	0.02	5.24921*
White, not of Hispanic origin	0.64	0.71	-3.95653*
American Indian/Alaska Native	0.01	0.01	-1.51437
LEP students	0.07	0.04	3.85667*
English as a second language	0.05	0.03	3.34799*
Bilingual education	0.04	0.02	2.14531
Free lunch program	0.44	0.36	4.90641*
Chapter 1	0.19	0.15	3.16017
Remedial reading	0.14	0.13	1.12654
Remedial math	0.09	0.08	0.94314
Programs for students w/disabilities	0.07	0.11	-5.11452*
Community background	5.56	5.62	-0.62165
Teacher Characteristics			
Mean teacher college SAT scores	918.5	946.06	-0.14477
Years of teaching experience	14.58	15.35	-2.37028
Adjusted teacher salary	33,557.08	36,680.62	-7.59162*
Teacher salary	33,456.99	37,638.89	-9.28059*
Teaching in field feel best qualified	0.78	0.75	2.27736
Weekly hours-other school activity	8.54	8.42	0.44595
Hours at school per week	31.73	31.29	1.21824
Weekly hours student interaction	2.69	2.92	-1.58161
Participated in activities related to teaching	3.48	3.44	0.60555
Opinion about impact of professional development †	13.28	13.40	-0.04419
Participation in professional development	4.00	3.72	2.53940
Support received for professional development	1.99	1.92	1.47531
Difficult filling vacancies †	6.97	6.82	0.40096

Note: * indicates that the differences are statistically significant

Note: † higher numbers indicate more negative situations

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire).

Table 8b— Comparison between SASS public schools with student achievement scores and other SASS public schools in the same state, continued

	Mean with achievement scores	Mean without achievement scores	With achievement scores in 19 states vs. without achievement scores
School Climate			
Teacher: basic standards	7.94	7.14	7.30338*
Teacher: attendance	6.76	6.58	1.79842
Teacher: behavior standards	6.91	6.79	0.08703
Teacher: respect for students	5.90	6.04	-1.05050
Teacher: satisfaction	6.97	7.02	-0.47318
Teacher: respect for teachers	6.44	6.41	0.40292
Attacked by student last year	1.96	1.93	2.37096
Ever physically attacked by student	1.90	1.87	2.31197
Ever threatened by students	1.79	1.72	3.77551*
Number of students tardy per wk.	3.78	5.27	-3.58306*
Class interruptions per week	17.73	15.58	0.60344
Principal: basic standard	8.81	7.91	9.78534*
Principal: community	6.30	6.36	-0.56166
Principal: attendance	6.78	6.64	1.28293
Principal: apathy	6.45	6.33	0.95423
Principal: respect for teachers	7.85	7.80	0.03095
Principal: respect for property	7.83	7.81	0.18126
Student non-attrition rate	1.11	1.10	0.89841
School Organization			
Student/teacher ratio	18.33	16.81	0.42503
Average class size	23.97	22.74	2.39036
Total enrollment	587.31	579.21	0.45278
Teacher satisfied with class size †	2.26	2.12	3.42154*
Teachers: influence on budget	3.20	3.16	0.55305
Teachers: determine in-service program	3.88	3.96	-1.33436
Teachers: influence discipline policy	3.99	4.05	-1.26478
Teachers: influence on hiring	2.65	2.77	-1.39270
Teachers: influence evaluating teachers	2.12	2.06	0.70914
Teachers' influence on curriculum	3.50	3.81	-5.02006*
Teachers' classroom control	6.46	6.56	-2.10792
Principal: determine in service program	3.95	3.95	-0.00559
Principal: influence on hiring	4.28	4.32	-0.86054
Principal: influence on discipline policy	4.34	4.39	-1.19416
Principal: influence on budget	3.80	3.83	-0.66493
Principal: influence evaluating teachers	4.67	4.76	-2.78376
Principal: influence on curriculum	3.35	3.65	-5.16164*
Sample size	**2,575**	**1,093**	**2,575 vs. 1,093**

School Climate

Cross-State Comparison. Principals in the 19 states represented in the study reported a larger number of students tardy per week and more problems with tardiness, poverty, and respect for property than principals in other states. Teachers in the 19 states observe more problems related to student attendance and report that students show less respect for teachers. These differences may, in part, be explained by the fact that states represented in the study contain somewhat more central city schools than do the other states (see Table 6). In general, public school teachers and principals who work in central city schools were more likely than their counterparts in other types of communities to report problems of these types.

Within-State Comparison. Differences between the SASS schools with achievement scores in the 19 states and other SASS schools in the same states are evident on only four of the twenty school climate measures. In schools with achievement scores, teachers and principals observe fewer problems with basic standards (e.g., drugs, alcohol dropping out, pregnancy), teachers report feeling threatened by students less often, and there is less student tardiness.

School Organization

Cross-State Comparison. Significant cross-state differences occur on measures of school size, average class size, teachers' satisfaction with class sizes, and teachers' and principals' influence over school policies. SASS schools in the 19 states represented in the study have greater total enrollments and larger class sizes. Teachers in these states are less satisfied with the sizes of their classes than are teachers in other states. In addition, they report less influence over curriculum and the evaluation of other teachers and more influence over hiring decisions. Principals and teachers in these states also report having more control over school budgets than their colleagues in other states.

Within-State Comparison. Teachers in the SASS schools with achievement scores are less satisfied with the sizes of their classes than are teachers in other schools in the same states. Principals and teachers in schools with achievement scores both indicated that they have less influence on curriculum.

Conclusion

The SASS achievement schools in the 19 states are somewhat different from the remaining SASS public schools, especially in student inputs and school organization. A larger percentage have many minority, ESL, bilingual education students, and students with less advantaged backgrounds. They tend to be in more central areas with larger class size and less teacher satisfaction on class size. The addition of a few states, especially those states which have more schools in rural areas, will add credibility to generalizations based on the research.

The difference between SASS schools with achievement scores in the 19 states and other SASS public schools in the same states are not remarkable. On only 16 out of 62 SASS measures are there statistically significant differences. SASS schools with achievement scores tend to be elementary schools and to have more Asian/pacific Islander, LEP, ESL bilingual education, and Chapter 1 students, but fewer students in programs with disabilities. Teacher are paid significantly less, and teachers are less satisfied with class size.

Fewer SASS-measure comparisons are significantly different within states than across states. One plausible explanation is the larger sample size in the across-state comparison (3,668 vs. 5,099) than the within-state comparison (2,575 vs. 1,093). The mean differences, also shown in Tables 8a and 8b, are similar sizes for both sets of comparisons.

3. Are there statistically meaningful school-level relationships between SASS measures and student achievement?

A test of the utility of the SASS student achievement measure is whether its use in analyses involving other SASS measures yields meaningful results. To address this question, we present some preliminary analytical results.

Consider two possible perspectives on education. One perspective, captured by the model presented in Figure 1, suggests that student background characteristics and school attributes both contribute meaningfully to student achievement. Students' backgrounds affect their achievement by affecting their readiness to learn and their in-school behavior. Teachers' qualifications and the climate and organization of the school similarly influence student learning by determining the quality of the instruction students' receive and the quality of their school experiences. *Student achievement is an outcome determined by all of the other factors.*

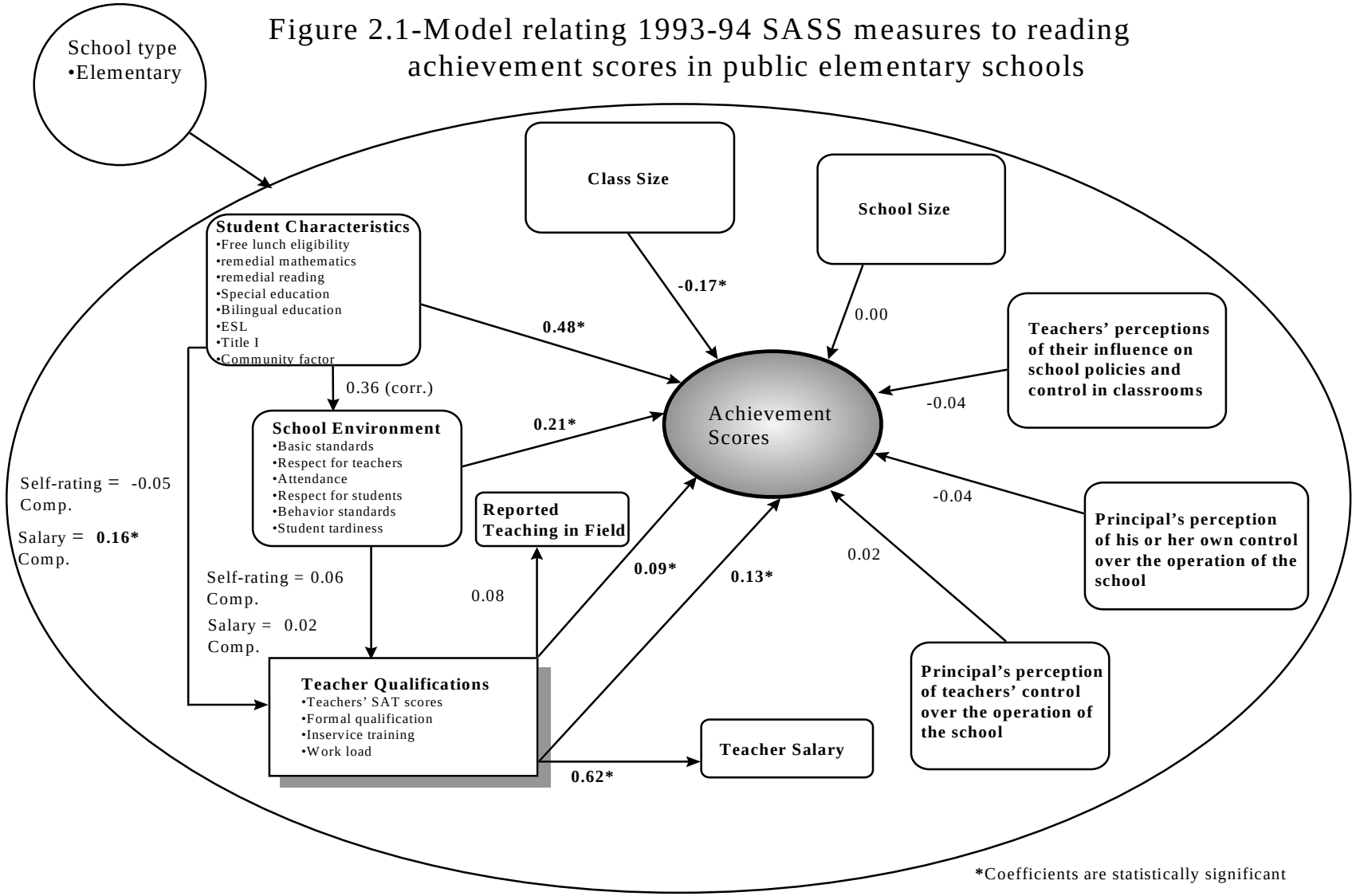
A second perspective, by contrast, implies that achievement is almost exclusively a function of students' background and that aspects of the school are a function of the surrounding community and the value placed within it on education. Where home and neighborhood environments are free of problems and provide strong academic supports, student achievement is high; where these environments are less conducive to learning, achievement can be expected to suffer. Schools, according to this perspective, do not influence student achievement so much as they are influenced by it. Higher achieving students from more advantaged backgrounds behave better in school which, in turn, leads to more orderly and disciplined school environments, easier recruitment of highly qualified teachers, and greater principal and teacher control over school operations. *Student achievement is an indicator of community values, and school characteristics are determined by those values.*

Both of these competing theoretical perspectives provide explanations for observed relations between student, teacher, and school characteristics and student

achievement. Despite the impossibility of drawing clear causal inferences that decide between these perspectives from cross-sectional correlational data, one can still gain substantial information from the analyses. The perspectives can serve to frame discussion of results, highlight possible alternative explanations for various findings, and point the way for controlled research projects.

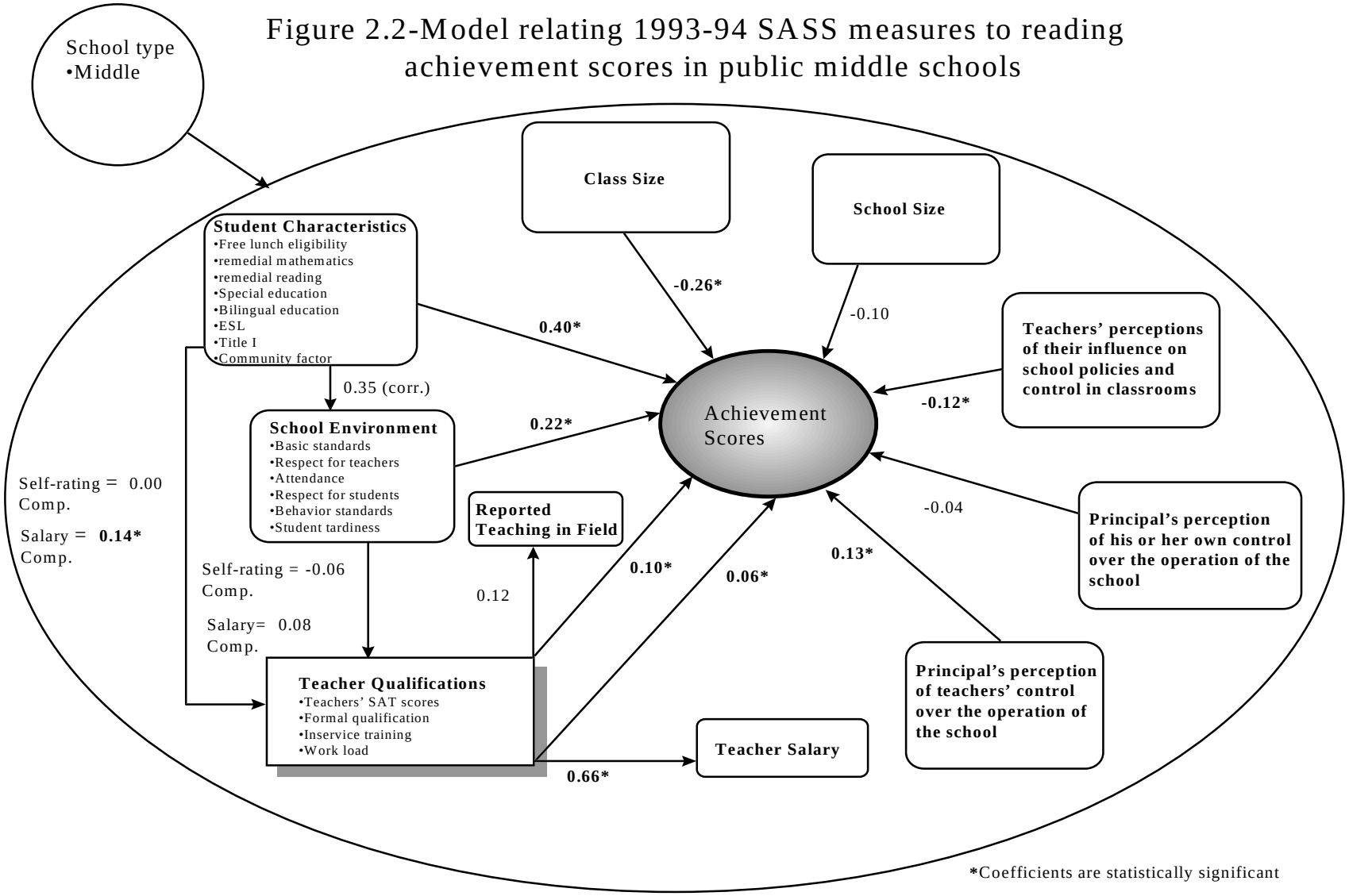
Figures 2.1, 2.2, and 2.3 present path coefficients associated with the model relating SASS variables to student achievement, separately for elementary, middle, and high schools. The likelihood of Type I errors in evaluating the significance of individual relationships can be expected to rise with the number of models considered. Accordingly, in examining results our focus is on patterns of relationships evident across the three school levels. Below, we consider findings for each of the four classes of variables represented in our model in turn. The indications of statistical significance in these preliminary analyses are based on average estimated design effects. In follow-up analyses, we will use standard SASS error estimation procedures (balanced repeated replications) to assess the significance of regression coefficients.

Figure 2.1-Model relating 1993-94 SASS measures to reading achievement scores in public elementary schools



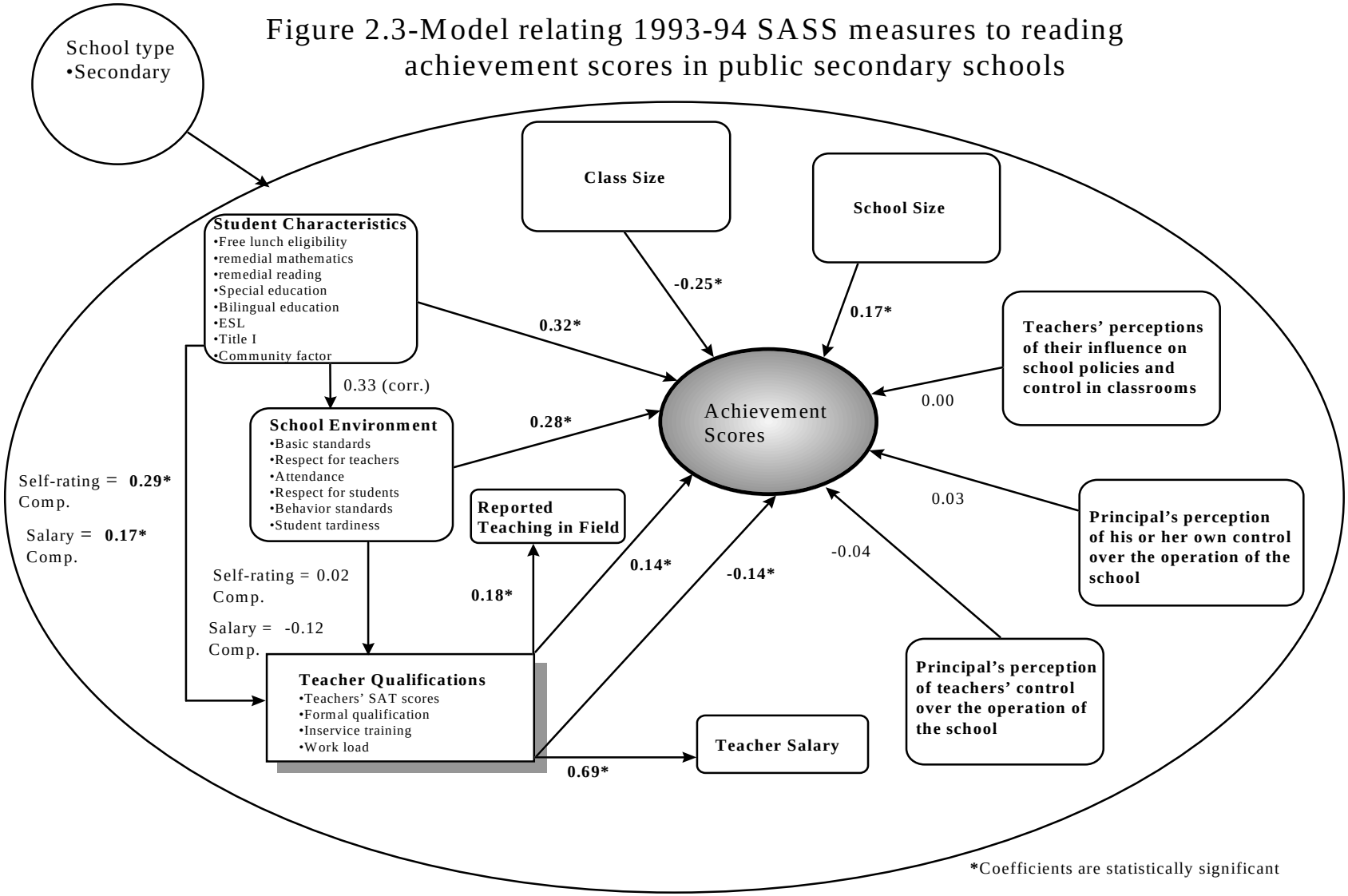
NOTE: Two teacher qualification factors were included in the model, one predictive of reported teaching in field and one predictive of teacher salary.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); 1994 NAEP Trial State Assessment in reading; state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

Figure 2.2-Model relating 1993-94 SASS measures to reading achievement scores in public middle schools



NOTE: Two teacher qualification factors were included in the model, one predictive of reported teaching in field and one predictive of teacher salary.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); 1994 NAEP Trial State Assessment in reading; state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

Figure 2.3-Model relating 1993-94 SASS measures to reading achievement scores in public secondary schools



NOTE: Two teacher qualification factors were included in the model, one predictive of reported teaching in field and one predictive of teacher salary.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); 1994 NAEP Trial State Assessment in reading; state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

Findings

Student background characteristics. At all three school levels, student background characteristics display strong relationships to student achievement. Notably, however, these relationships appear to weaken somewhat from elementary school to middle school to high school. At least three explanations for the latter finding are possible: (1) achievement may be more highly linked to students' backgrounds in the early grades because the subject matter is more likely to be encountered and mastered outside of school; (2) the stronger association in the early grades may reflect the more limited time these students have been exposed to school influences, implying that over time schools have a leveling effect on individual differences; or (3) it may simply be the case that achievement tests used in the early grades are more sensitive to student differences than achievement tests used in the upper grades.

School climate. As predicted, more orderly and disciplined school climates are associated with higher levels of achievement in elementary, middle, and high schools. In contrast to the results for student background characteristics, however, relationships of climate to achievement appear to strengthen with school level. Once again, multiple explanations for this pattern of findings are possible: (1) disciplinary problems may have a greater effect on achievement in the higher grades (the greater independence of students and potential severity of problems may make maintaining an orderly school environment more important in the higher grades); (2) disciplinary problems may have cumulative effects on students' achievement over time; or (3) perhaps, in fact, poor achievement leads to poor behavior, and the negative effects of poor achievement on behavior are more pronounced in the upper grades (as might be the case if poor performance in school has a greater downward influence on students' educational expectations and aspirations in the upper grades).

Teacher qualifications. Measures of teachers' qualifications are positively related to student achievement at all three school levels, with the exception of the salary-predictive composite, which is negatively related to achievement in high schools. The latter result is both unexpected and difficult to explain. The negative association between the salary-predictive composite and achievement at the high school level is observed whether the model is run with weighted or unweighted data and does not appear to be attributable to collinearity between the two teacher qualification measures; the correlations between the salary-predictive composite and the reported-teaching-in-field-predictive composite at all three levels are modest, with absolute values less than 0.25. The relationships between these measures and achievement require further study using SASS. Also, it should be added, the raw correlation between average teacher salary and average student achievement is negative in the high school sample. One very positive interpretation of this finding would be that equity issues are attracting the most highly qualified teachers to the high schools where they are needed most; that is, to the schools where student achievement has been lowest. However, this is but one of several possible competing inferences.

School organization. Class size is inversely related to student achievement in elementary, middle, and high schools. However, while most extant research suggests that class-size reductions yield the greatest achievement gains in the early grades, our results suggest instead that the relationship between class size and achievement strengthens with school level. While somewhat surprising, this pattern is perhaps understandable in the context of our findings regarding school climate. The relationships of both climate and class size to achievement appear to grow in magnitude from elementary to middle to high school, suggesting that school factors may, in general, be more importantly related to achievement in the later grades than in the early grades. Alternatively, it may be that affluent communities, with high achieving students, place a greater premium on small class sizes in the later grades than do other communities.

School size relates differently to achievement at different school levels. While school size is positively associated with achievement at the high school level, it is negatively associated with achievement at the middle school level (though not quite significantly). Among elementary schools, school size and achievement were similarly found to be negatively related *when the model was run with unweighted data*. With weighted data, however, no significant relationship is evident at the elementary level, for reasons yet to be determined. Taken together, these results may suggest that while elementary and middle school students benefit from the more personalized educational experiences associated with smaller schools, at the high school level the greater diversity of offerings and opportunities associated with larger schools becomes more important. Alternatively, achievement may be greater in urban settings, where large high schools tend to be found, than in rural settings.

The three variables concerned with principal and teacher control over the operation of the school were not found to be consistently related to achievement across the three school levels. While it may be that these variables are not associated with student achievement, it is also possible that they have other, indirect effects not represented in our model or that controlling for factors, such as the characteristics of principals and teachers, would reveal their associations with achievement.

Comments

The effective schools literature has been criticized for relying heavily on case-study data and small samples of schools thought to be functioning extremely well or extremely poorly (Purkey and Smith, 1983). The SASS student achievement subfile, by contrast, provides an opportunity to explore factors that relate to student achievement with a much more representative base of data on several thousand public schools. Though unambiguous causal inferences cannot be made, student background characteristics and school attributes are both found to relate in important ways to achievement.

The effective schools literature has also been criticized for overlooking the fact that school experiences may have very different outcomes for different student

populations (Purkey and Smith, 1983). The SASS student achievement subfile can be used to consider how school environment, teacher qualifications, school organization, or other aspects of schooling measurable with SASS variables affect different types of student bodies. One avenue for future work is to explore the extent to which the relationships of these variables to achievement are moderated by the characteristics of the student bodies of schools.

4. Does incorporating between-state variation into the student achievement score, using NAEP data, increase the power of the student achievement measure?

As described in Chapter 2, there are two achievement measures: a within-state measure ("State-z) and a between-state measure ("Achieve"). Achievement scores from state assessments, along with all SASS measures, were first standardized by state and grade level for within-state school-level analyses. State school-level variation was then incorporated by adding the NAEP state mean to scores for schools in each state and multiplying the within-state deviations by (a) the NAEP standard deviation in the state and (b) the correlation between NAEP and the state assessment in the state. The results are shown in Table 9. Omitting the correlation factor, one obtains the results shown in Table 10. Omitting the NAEP-adjustment completely, one obtains the results shown in Table 11.

The incorporation of between-state variation using NAEP increases the power of the student achievement measure. For all school types except middle schools, the adjusted R^2 associated with models relating SASS measures to student achievement are higher where the NAEP-adjusted achievement scores are used rather than the standardized scores. Comparing Tables 9 and 11, the SASS measures explain 5%, 6%, and 6% more of the NAEP-adjusted achievement scores than the within-state standardized scores for elementary, secondary, and combined schools, respectively. (For middle schools, the difference is reversed, -2%.) The relationships of school environment, class size and school size to achievement are not statistically significant when the within-state standardized scores are used, but the relationships are statistically significant when the NAEP-adjusted achievement scores are used. Therefore, it is clear that the use of NAEP data to incorporate between-state variation, as well as within-state variation, into the SASS student achievement score increases the power of the student achievement analyses using SASS.

Comparing Tables 9 and 10, one finds that the adjusted R^2 are slightly *higher* when the correlation factor is omitted, for all school types except secondary schools. The difference is so minor that there are virtually no differences as a result of including the correlation factor.

Table 9— OLS estimate of student achievement (with NAEP mean, standard deviation, and correlation)

	Elementary	Middle	Secondary	Combined
Student Characteristics	0.475	0.396	0.315	0.357
	(18.762)	(10.139)	(8.541)	(6.884)
Teacher Qualification	0.094	0.103	0.144	0.209
(Reported teaching in	(3.611)	(2.868)	(3.988)	(4.176)
Field)				
Teacher Qualification	0.133	0.061	-0.137	0.002
(Teacher salary)	(5.067)	(1.629)	(-3.842)	(0.032)
School Environment	0.214	0.224	0.280	0.140
	(8.283)	(5.263)	(7.182)	(2.698)
Teacher Control	-0.042	-0.122	-0.006	-0.092
	(-1.664)	(-3.714)	(-0.159)	(-1.872)
Principals' Perception	0.018	0.135	-0.038	0.190
of Teacher Control	(0.550)	(2.711)	(-0.884)	(3.102)
Principal's Perception	-0.042	-0.037	0.030	-0.019
of Own Control	(-1.174)	(-0.742)	(0.712)	(-0.320)
Class Size Factor	-0.167	-0.263	-0.250	-0.334
	(-6.727)	(-6.458)	(-6.036)	(-5.795)
School Size	0.004	-0.104	0.172	0.279
	(0.172)	(-2.422)	(4.230)	(4.740)
Sample Size	1,096	515	609	355
Adjusted R^2	0.4101	0.3637	0.3517	0.3179

Note: Entries are standardized regression coefficients. Values of Student's t are shown in parentheses.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); 1994 NAEP Trial State Assessment in reading; state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

Table 10— OLS estimate of student achievement (with NAEP mean and standard deviation)

	Elementary	Middle	Secondary	Combined
Student Characteristics	0.472	0.402	0.305	0.388
	(18.830)	(10.363)	(8.230)	(7.520)
Teacher Qualifications	0.074	0.113	0.134	0.175
(Reported Teaching in Field)	(2.860)	(3.161)	(3.693)	(3.502)
Teacher Qualifications	0.137	0.053	-0.114	-0.020
(Teacher Salary)	(5.281)	(1.426)	(-3.190)	(-0.393)
School Environment	0.244	0.266	0.315	0.161
	(9.517)	(6.272)	(8.031)	(3.113)
Teacher Control	-0.023	-0.119	-0.014	-0.098
	(-0.949)	(-3.105)	(-0.368)	(-1.984)
Principal's Perception of Teacher Control	0.044	0.133	-0.028	0.184
	(1.230)	(2.698)	(-0.651)	(3.022)
Principal's Perception of Own Control	-0.054	-0.040	0.034	-0.022
	(-1.523)	(-0.806)	(0.800)	(-0.372)
Class Size Factor	-0.127	-0.222	-0.209	-0.258
	(-5.165)	(-5.506)	(-5.033)	(-4.495)
School Size	0.009	-0.070	0.190	0.244
	(0.355)	(-1.638)	(4.655)	(4.162)
Sample Size	1,096	515	609	355
Adjusted R^2	0.4211	0.3720	0.3442	0.3226

Note: Entries are standardized regression coefficients. Values of Student's t are shown in parentheses.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); 1994 NAEP Trial State Assessment in reading; state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

Table 11— OLS estimate of standardized student achievement scores

	Elementary	Middle	Secondary	Combined
Student Characteristics	0.457	0.402	0.266	0.194
	(16.948)	(10.064)	(7.025)	(3.698)
Teacher Qualifications	0.029	0.055	0.183	0.060
(Reported Teaching in Field)	(0.671)	(1.573)	(4.659)	(1.268)
Teacher Qualifications	0.050	0.010	-0.143	0.063
(Teacher Salary)	(1.173)	(0.293)	(-3.797)	(1.340)
School Environment	0.257	0.340	0.337	0.296
	(9.310)	(8.317)	(8.562)	(5.869)
Teacher Control	-0.028	-0.082	-0.035	-0.026
	(-1.040)	(-2.220)	(-0.916)	(-0.538)
Principal's Perception of Teacher Control	0.048	0.095	-0.060	0.042
	(1.422)	(2.164)	(-1.459)	(0.735)
Principal's Perception of Own Control	-0.042	-0.016	0.077	0.095
	(-1.266)	(-0.363)	(1.874)	(1.703)
Class Size Factor	-0.042	-0.053	-0.034	0.217
	(-1.617)	(-1.392)	(-0.805)	(3.559)
School Size	0.044	-0.019	0.160	0.033
	(1.687)	(-0.521)	(3.985)	(0.559)
Sample Size	1,096	515	609	355
Adjusted R^2	0.3653	0.3867	0.2938	0.2530

Note: Entries are standardized regression coefficients. Values of Student's t are shown in parentheses.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993-94 Schools and Staffing Survey (Public School Teacher Questionnaire, Principal Questionnaire, and School Questionnaire); state assessment files for 19 states; and data on SAT scores of incoming freshmen at U.S. colleges and universities obtained from the Higher Education Research Institute at the Graduate School of Education, University of California at Los Angeles.

5. Can between-state variation in student achievement be extrapolated from elementary level scores to secondary level scores?

The NAEP 4th grade sample was used to construct achievement scores that account for between-state variation. That is, the between-state variation component for all schools was set to the value determined for 4th grade. Will the model, therefore, predict achievement in elementary schools better than in secondary schools?

Table 9 and Table 11 show the results of regressing NAEP-adjusted achievement scores and standardized achievement scores on SASS measures of student characteristics and school attributes. The differences in R^2 between these two tables indicate the contribution of the between-state NAEP-based scale adjustment. The adjusted R^2 increases from 0.3653 to 0.4101 for elementary schools when NAEP-adjusted achievement scores rather than standardized state assessment scores are used. For secondary schools, the adjusted R^2 increases from 0.2938 to 0.3517. The similarity of the gains at the elementary and secondary levels suggests that between-state variation in average student reading achievement can be extrapolated from the elementary level to the secondary level, for the purposes of exploring school effectiveness using SASS.

Conclusion

Summary of Findings

The present study sought to evaluate the feasibility and value of adding school-level state assessment data to the SASS database. The principal goals of the study were to establish whether existing state files of assessment data can easily be acquired and matched to SASS public school records and whether aggregation of analyses across different state assessments can be carried out in a valid manner. To address these issues, 1993-94 reading assessment data from 19 states, collected previously as part of another project, were matched to 1993-94 SASS public schools. Because the Common Core of Data contains dual identification codes for public schools (one set for national use, including SASS public school sampling, and another set consisting of the various state-assigned school codes), the process of matching was feasible, although about one-third of public schools do not have state assessment scores. Average reading achievement scores were identified for a total of 2,575 SASS public schools in 19 states. To remove irrelevant scaling differences between states, state assessment scores were standardized in each state. Then, to reflect between-state variation in achievement, State NAEP reading assessment data were used for state-level means and standard deviations. Correlations of school means between state reading assessments and State NAEP were examined to refine the resulting SASS achievement measure.

Once SASS and state assessment data had been merged, a series of analyses were carried out to evaluate the pilot student achievement subfile and explore the value the

addition of student achievement data would have for SASS. These analyses addressed five research questions.

How close are the (NAEP-transformed) SASS student achievement scores to NAEP school means? The correlations of state assessment school means and NAEP school means were computed for states included in the pilot SASS student achievement subfile, based on the State NAEP samples in those states and, separately, based on an overlap sample of 208 schools that participated in both SASS and State NAEP in these states in 1993-94. Most of the resulting correlations were greater than 0.70, suggesting that the validity of the SASS student achievement measure as an indicator of school reading performance is sufficient for research use.

How similar are SASS public schools with student achievement scores to other SASS public schools? Statistical comparisons, on approximately 50 SASS school measures, were made (1) between SASS public schools in the 19 states included in the pilot SASS student achievement subfile and SASS public schools in other jurisdictions, and (2) between SASS public schools included in the SASS student achievement subfile and other SASS public schools in the same states. Although statistically significant differences were found, they were not large, suggesting that while inclusion of achievement data from a larger number of states may be desirable to increase the representativeness of the data set, generalizations based on the pilot SASS student achievement subfile can be made meaningfully.

Are there statistically meaningful school-level relations between the student achievement measure and SASS measures? A major aim of the study was to evaluate whether meaningful inferences could be made at the school level by examining the relations between SASS measures and student achievement measures. A preliminary model was developed relating average student achievement in a school to student background measures, the school climate, teacher qualifications, and organizational factors such as class sizes, school size, and principal and teacher control over school operations. Estimates of "path coefficients" based on this model were compared across elementary, intermediate, and high schools. Preliminary results indicated that statistically significant and meaningful inferences can indeed be made from analyses of the school-level correlates of student achievement obtained through SASS. These inferences based on SASS data may point the way for controlled studies of the effectiveness of educational policy options.

Does incorporating between-state variation into the student achievement score, using NAEP data, increase the power of the student achievement measure? Two sets of analyses based on the preliminary model were carried out, the first using the pooled (within-state) state assessment measures and the second adding the variation between state reading achievement means indicated by State NAEP. SASS school-level measures explained a greater percentage of the variation in average student achievement where the latter achievement measure was used than where the former measure was used,

confirming the value of transforming different state assessments onto a common metric that includes between-state variance.

Can between-state variation in student achievement be extrapolated from elementary level scores to secondary level scores? Although the State NAEP reading scores were only available at the fourth grade level, state assessment scores are available in many states for grades ranging from 3 to 11. Analyses relating SASS measures to state assessment scores can, therefore, be carried out separately for public elementary, intermediate, and high schools. To the extent that between-state variation in fourth grade reading achievement, as measured by State NAEP, is indicative of between-state reading achievement variation in later grades, the same NAEP-based adjustment for between-state variation can be added to reading scores in all grades. Comparative analyses were carried out to assess whether this adjustment was accompanied by degradation of the preliminary model's predictive power in the higher grades, but no noticeable degradation was observed.

Value of the SASS Student Achievement Subfile

The potential value of the SASS student achievement subfile for educational policy analysis is enormous. Although it cannot substitute for a controlled experiment in attempting to make causal inferences, it can provide *a uniquely powerful source of evidence on the relations among school factors and average school achievement*. It is based on a sample that is representative of a substantial portion of the nation's schools and is of sufficient size to identify important patterns; it includes a wide range of information on school programs, resources, and dynamics; and it includes in-depth assessments of teacher and principal characteristics and attitudes about teaching, the students, and the school.

The value of the SASS student achievement subfile lies not only in its relevance for national-level policy research but also in its relevance for state-level reform efforts. Because SASS collects information that encompasses educational practices that state reforms are striving to affect, analyses within each state can enhance the interpretation of state assessment scores, while at the same time showing how each state relates to a combination of other states.

There is also an indirect value to be gained from creating the SASS student achievement subfile. By incorporating a state-produced data source into SASS, NCES increases the role of state education agencies as constituencies of SASS. To the extent that each state sees a role for SASS in helping to interpret its state assessment and reform results in a national context, the potential for an integrated state-federal school-level data system aimed at improving each state's policy research capacity is fostered.

Next Steps

Based on the positive results of the pilot study, we plan to carry out additional activities to complete the SASS student achievement subfile for the 1993-94 survey and to publish a report on factors related to student achievement based on analyses of 1993-94 SASS. In particular, we will:

- add state assessment data for a few additional states,
- add state assessment data for 1992 and 1996, for some states, and
- add state mathematics assessment scores to the file.

We will also investigate various analytical issues related to the use of state assessment achievement scores in analyses based on SASS, including:

- differences in models for reading and for mathematics achievement,
- variation between assessments in different grade levels,
- relations between average student achievement and other outcome indicators, and
- variation of results between states.

Finally, we will report on the estimated costs associated with the creation of a student assessment subfile in a similar manner for future SASS files and summarize existing information about the expected availability of state student assessment data in the future. Ideas for extending the subfile in the future, for example by requesting reported average achievement scores in nationally standardized tests from participating private schools, will be explored.

As proposed, the procedures for creating a SASS student achievement subfile have no direct implications for changes in the design of SASS. However, two aspects of the current design are important: (1) the inclusion of a sufficiently large sample of schools in each state to ensure sufficient degrees of freedom for taking into account the state assessment mean and standard deviation at each assessed grade and (2) the inclusion of a sufficiently large sample of teachers in each participating school to produce school-level average estimates for teacher survey responses. Both aspects of SASS add power to achievement analyses as well as to other SASS analyses.

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Appendix A

Technical Notes

I. Factor Analysis of Teacher and Principal Attitudinal Items

A series of attitudinal items were included in the principal's and teacher's questionnaires for SASS. These items were previously factor analyzed to identify a set of factors that would provide more reliable information about teachers, administrators, and their schools than individual items. These are basically the same factors that were used in the Private Schools in the United States: A Statistical Profile, 1993-94 (McLaughlin and Broughman, 1997). Some of these factors were included in the Student Characteristic, School Environment, and Teacher's Classroom Control Composites used in this project, instead of the original variables. They are scaled from 0 to 10 in which 10 indicates the least problem and most teacher control. Please note that the items for the principal and teacher questionnaires are different.

The SASS items used in constructing the factors are the following:

Item 47-a set of 25 items to be rated on a four-point scale from "strongly agree" to "strongly disagree," of which the following 3 were used:

e. level of student misbehavior

k. principal enforces school rules for student conduct and backs me up

m. rules for student behavior are consistently enforced by teachers

Item 46-a set of 23 items about problems rated on a four-point scale of "not a problem, minor, moderate, serious," of which the following 20 were used:

a. student tardiness

b. student absenteeism

c. teacher absenteeism

d. students cutting class

e. physical conflicts among students

f. robbery theft

g. vandalism of school property

h. student pregnancy

i. student use of alcohol

j. student drug abuse

k. student possession of weapons

l. verbal abuse of teachers

m. student disrespect for teachers

n. students dropping out

o. student apathy

p. lack of academic challenge

q. lack of parental involvement

r. parental alcoholism and drug abuse

s. poverty

t. racial tension

Item 44-a set of 6 items on influence on school policies, scaled from 0 ("no influence") to 5 ("a great deal of influence"), of which the following one was used:

f. establishing curriculum

Item 45-a set of 6 items on control of classroom practices, scaled from 0 ("no control") to 5 ("complete control"):

a. selecting textbooks and other instructional materials

b. selecting context, topics, and skills to be taught

c. selecting teaching techniques

d. evaluating and grading students

e. discipline students

f. determining the amount of homework to be assigned

Item 24-a set of 2 items from principal questionnaire on school problems, scaled from 1 ("serious") to 4 ("not a problem"):

p. lack of academic challenge

q. lack of parent involvement

Eleven factors were identified, the first of which was included in the student characteristics composite, the next eight of which were included in the school climate composite, and the last two of which were included as an organizational composite:

Community: Lack of serious problems stemming from parental alcoholism/drug abuse, poverty, and racial tension. Item 46 - (r, s, t)

Basic Standards: Lack of serious problems with robbery, drug abuse, alcohol, pregnancy, and dropouts. Item 46 - (f, h, i, j, n)

Attendance: Lack of serious tardiness and absence problems. Item 46 - (a, b, c, d)

Respect for Teachers: Lack of serious problems with verbal abuse and disrespect of teachers. Item 46 - (e, k, l, m)

Respect for Students: Belief that students are capable of learning and do not have attitudes and habits that reduce their learning potential. Item 47 - (e)

Apathy: Item 47 (p,q)

Respect for Property: Lack of vandalism and theft (factor for principals only). Item 46 - (f, g)

Behavior Standards: Systematic enforcement of agreed upon discipline policy and student behavioral standards. Item 47 - (k, m)

Satisfaction: Choose to become teacher again. Item 48

Teachers' Influence on Curriculum: Item 44 - (f), Item 45 - (a, b)

Teachers' Classroom Control: Selecting teaching techniques, assigning homework, and evaluating and disciplining students. Item 45 - (c, d, e, f)

II. College quality data: SAT scores

The data file underlying the estimates of college quality was obtained from the *Higher Education Research Institute at the Graduate School of Education*, University of California at Los Angeles. The item used is the SAT score for incoming students for the years 1972, 1978, and 1982. These data were obtained in electronic form for approximately 2,300 colleges in the United States. The procedures for using the SAT score database were as follows:

(1) The SAT score database was matched to the 1982-83 HEGIS (IPEDS predecessor) dataset by FICE code identifiers to pick up college names.

(2) The database was then matched to the 1987-88, 1990-91, or 1993-94 IPEDS dataset by FICE code to check for consistency of identifying codes through the years (FICE code identifiers change as colleges lose and gain accreditation).

(3) Finally, the database was matched to individual teacher records on SASS by IPEDS identification codes.

III. CCD variables and state file variables used to merge SASS with state assessment data

State	Primary CCD variables	Primary state variables	Secondary state variables
Alabama	sc_city, sc_name	city (12), sch_name (18)	
California	sc_stid (7), sc_stsid (7)[17]	sch_code (14)	sch_name
Delaware	sc_stid (5)	distcode (2), sch_code (3)	sch_name
Florida	sc_stid (2), sc_stsid (4)	distcode (2), sch_code (4)	sch_name
Georgia	sc_stid (3), sc_stsid (4)	syscode (3), sch_code (4)	sch_name
Hawaii	sc_stsid (3-7)	sch_code (5)	sch_name
Kentucky	sc_stsid (4-12)	sch_code (9)	distname, sch_name
Louisiana	sc_stsid (6)	sch_code (6)	No
Maine	sc_stsid (5)	sch_code (5)	sch_name, distcode
Massachusetts	sc_stsid (6)	sch_code (6)	sch_name
Michigan	sc_stid (5), sc_stsid (4)	distcode (5), sch_code (4)	sch_name, distname
Montana	sc_stid (10-13)	le (4)	district (sch_name)
New York	sc_stsid (12)	sch_code (12)	None
Pennsylvania	sc_stsid (13)	distcode (9), sch_code (4)	distname, sch_name
Rhode Island[18]		s_city (15), sch_name (31)	distname, sch_name
Tennessee	00, sc_stid (3), sc_stsid (4)	syscode (5), sch_code (5)	sch_name, city
Texas	sc_stsid (9)	sch_code (campus) (9)	sch_name
Utah	sc_stid (2), sc_stsid (4-6)	distcode (2), sch_code (3)	sch_name
Washington	sc_stid (5), sc_stsid (4)	distcode (5), sch_code(bldg) (4)	sch_name, distname

Note: Numbers in parentheses indicate the number of characters used in the particular code field. For example, in Florida, the district code has two digits and the school code has four digits. Names for state variables have been regularized across states for presentation in this table.

[17] 7 digits of the CCD State Agency ID and 7 digits of the CCD State School ID were combined to merge with the 14 digits sch_code from the state assessment file in California. Different numbers of digits were used in different states

[18] We did not use CCD variables for Rhode Island because we merged the SASS schools with the state assessment schools in a booklet.

Listing of NCES Working Papers to Date

Please contact Ruth R. Harris at (202) 219-1831
if you are interested in any of the following papers

Number	Title	Contact
94-01 (July)	Schools and Staffing Survey (SASS) Papers Presented at Meetings of the American Statistical Association	Dan Kasprzyk
94-02 (July)	Generalized Variance Estimate for Schools and Staffing Survey (SASS)	Dan Kasprzyk
94-03 (July)	1991 Schools and Staffing Survey (SASS) Reinterview Response Variance Report	Dan Kasprzyk
94-04 (July)	The Accuracy of Teachers' Self-reports on their Postsecondary Education: Teacher Transcript Study, Schools and Staffing Survey	Dan Kasprzyk
94-05 (July)	Cost-of-Education Differentials Across the States	William Fowler
94-06 (July)	Six Papers on Teachers from the 1990-91 Schools and Staffing Survey and Other Related Surveys	Dan Kasprzyk
94-07 (Nov.)	Data Comparability and Public Policy: New Interest in Public Library Data Papers Presented at Meetings of the American Statistical Association	Carrol Kindel
95-01 (Jan.)	Schools and Staffing Survey: 1994 Papers Presented at the 1994 Meeting of the American Statistical Association	Dan Kasprzyk
95-02 (Jan.)	QED Estimates of the 1990-91 Schools and Staffing Survey: Deriving and Comparing QED School Estimates with CCD Estimates	Dan Kasprzyk
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95-04 (Jan.)	National Education Longitudinal Study of 1988: Second Follow-up Questionnaire Content Areas and Research Issues	Jeffrey Owings
95-05 (Jan.)	National Education Longitudinal Study of 1988: Conducting Trend Analyses of NLS-72, HS&B, and NELS:88 Seniors	Jeffrey Owings

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95-14 (Mar.)	Empirical Evaluation of Social, Psychological, & Educational Construct Variables Used in NCES Surveys	Samuel Peng
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